The Canadian
Medical Association Journal

Vol. XVI TORONTO, MARCH, 1926 No. 3

An Address

DIABETES AND INSULIN

BEING THE NOBEL LECTURE DELIVERED AT STOCKHOLM ON SEPTEMBER 15TH, 1925

BY FREDERICK G. BANTING

Gentlemen:

I VERY deeply appreciate the honour which you have conferred upon me in awarding the Nobel prize for 1923 to me and Professor J. J. R. Macleod.—I am fully aware of the responsibility which rests upon me to deliver an address in which certain aspects of the work on insulin may be placed before you. This I propose to do to-day and I regret that an earlier opportunity has not been afforded me of satisfying this obligation.

Since von Mering and Minkowski proved that removal of the pancreas produced severe and fatal diabetes in dogs, physiologists and clinicians have frequently endeavoured to obtain from the pancreas an internal secretion which would be of value in the treatment of diabetes mellitus. Beginning with Minkowski himself many observers tried various forms of extracts of the pancreas. Among the extractives used were water, saline, alcohol and glycerin. The extracts thus obtained were administered by mouth, subcutaneously, intravenously or by rectum, both to experimental animals and humans suffering from diabetes. Little or no improvement was obtained and any favourable results were overshadowed by their toxic effects. In 1908, Zuelzer tried alcoholic extracts on six cases of diabetes mellitus and obtained favourable results, one case of severe diabetes becoming sugar free. His extracts were then tried by Forschbach in Minkowski's clinic with less favourable results, and the investigation was abandoned by this group of workers. Rennie found that the islet cells existed separate from the acinar cells in certain bony fishes and in conjunction with Fraser extracts of the principal islet cells were tried both on animals and on the human. Their results, however, were not sufficiently convincing to warrant clinical application. The problem of the extraction of the antidiabetic principle from the pancreas was then taken up for the most part by physiologists among whom were Scott, Paulesco, Kleiner and Murlin.

While these efforts were being made by the physiologists valuable knowledge was being gained on carbohydrate metabolism. Lewis and Benedict, Folin and Wu, Schaffer and Hartman, and Ivar Bang had elaborated methods whereby the percentage of sugar in a small sample of blood might be accurately estimated. At the same time a vast amount of knowledge was accumulating on basal metabolism. Special attention was being given to the relative importance of various foodstuffs, and emphasis was being put on dietetic treatment of diabetes. Guelpa, Van Nordam, Allen, Joslin and Woodyatt, had elaborated systems of diabetic diet.

On October 30, 1920, I was attracted by an article by Moses Baron, in which he pointed out the similarity between the degenerative changes in the acinus cells of the pancreas following experimental ligation of the duct, and the changes following blockage of the duct with gallstones. Having read this article the idea presented itself that by ligating the duct and allowing time for the degeneration of the acinus cells, a means might be provided for obtaining an extract of the islet cells free from the de-

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stroying influence of trypsin and other pancreatic enzymes.

On April 14, 1921, I began working on this idea in the Physiological Laboratory of the Univertsity of Toronto. Professor Macleod allotted me Dr. Charles Best as an associate. Our first step was to tie the pancreatic ducts in a number of dogs. At the end of seven weeks these dogs were chloroformed. The pancreas of each dog was removed and all were found to be shrivelled, fibrotic, and about one-third the original size. Histological examination showed that there were no healthy acinus cells. This material was cut into small pieces, ground with sand, and extracted with normal saline. This extract was tested on a dog rendered diabetic by the removal of the pancreas. Following the intravenous injection the blood sugars of the depancreatized dogs were reduced to a normal or subnormal level, and the urine became sugar free. There was a marked improvement in the general clinical condition as evidenced by the fact that the animals became stronger and more lively, the broken down wounds healed more kindly, and the life of the animal was undoubtedly prolonged.

The beneficial results obtained from this first type of extract substantiated the view that trypsin destroyed the antidiabetic principle and suggested the idea that by getting rid of the trypsin an active extract might be obtained. The second type of extract was made from the pancreas of dogs in which acinus cells had been exhausted of trypsin by the long continued injection of secretin. Although many of the extracts made in this manner produced marked lowering of blood sugar and improvement in the general clinical condition it was not always possible to completely exhaust the gland, consequently toxic effects frequently resulted.

The third type of extract used in this series of experiments was made from the pancreas of fœtal calves of less than four months development. Laguesse had found that the pancreas of new-born contained comparatively more islet cells than the pancreas of the adult. Since other glands of internal secretion are known to contain their active principle as soon as they are differentiated in their embryological development, it occurred to me that trypsin might not be present since it is not used till after the birth of the animal. Later I found that Ibrahim had shown that trypsin is not present till seven or eight months of intrauterine development. Fœtal extracts could be prepared in a much more concentrated solution than the former two varieties of extract. It produced marked lowering of blood sugar, urine became sugar free and there was marked clinical improvement. Its greatest value however was that the abundance in which it could be obtained enabled us to investigate its chemical extraction.

Up to this time saline had been used as an extractive. We now found that alcohol slightly acidified extracted the active principle, and by applying this method of extraction to the whole adult beef pancreas active extracts comparatively free from toxic properties were obtained.

Since all large scale production methods for the preparation of insulin to-day have the acid-alcohol extraction as the first step in the process it may be well to elaborate on the methods of preparation at this stage. Insulin was prepared by the extraction of fresh glands with faintly acid alcohol. The concentration of alcohol in the original experiments varied from forty to sixty per cent. The alcoholic solution of pancreas was filtered and the filtrate concentrated by evaporation of the alcohol and water in vacuo or in a warm air current. Lipoid material was removed by extracting the residue with toluene or ether. The resulting product was the original whole gland extract. We were able to show that the active material contained in this extract was practically insoluble in 95 per cent alcohol. The extracts prepared in this way were tried on depancreatized dogs and in all cases the blood sugar was lowered. In one early case hypoglycæmic level was reached and the dog died from what we now know to be a hypoglycæmic reaction.

It had been known that depancreatized dogs were unable to store glycogen in the liver, and that glycogen disappears in three or four days after pancreatectomy. We found that by the administration of glucose and extract the diabetic dog was enabled to store as much as 8 per cent to 12 per cent glycogen. Diabetic dogs seldom live more than twelve to fourteen days. But with the daily administration of this whole gland extract we were able to keep a depancreatized dog alive and healthy for ten weeks. At the end of this time the dog was chloroformed and a careful autopsy failed to reveal any islet tissue.

The extract at this time was sufficiently purified to be tested on three cases of diabetes mellitus in the wards of the Toronto General Hospital. There was a marked reduction in blood sugar and the urine was rendered sugar free. However the high protein content rendered the continuous use undesirable, due to formation of sterile abscesses.

At this stage in the investigation, February, 1922, Professor Macleod abandoned his work on anoxæmia and turned his whole laboratory staff on the investigation of the physiological properties of what is now known as insulin. Dr. Collip took up the biochemical purification of the active principle and ran the scale of fractional precipitation 70 per cent to 95 per cent alcohol and succeeded in obtaining a more improved end product. But unfortunately his method was not applicable to large scale production. Dr. Best then took up the large scale production and contributed greatly to the establishment of the principles of production and purification. This work was carried out in the Connaught Laboratories under Prof. Fitzgerald who is kind enough to be here to-day. It had been found that the final product obtained by the earlier methods was not sufficiently pure for prolonged clinical use and efforts were made to secure a better product. The benzoic acid method of Maloney and Findlay which depends upon the fact that insulin is absorbed from watery solutions by benzoic acid was successfully used in Connaught Laboratories for several months.

Professor Shaffer of Washington University, St. Louis, and his collaborators, Somogyi and Doisy, introduced a method of purification which is known as the isoelectric process. This method depends upon the fact that if a watery solution of insulin is adjusted to approximately PH 5 a precipitate settles out which contains much of the potent material and relatively few impurities. Dudley has found that insulin was precipitated from water solutions by picric acid and he made use of this fact to devise a very ingenious method for the purification of the active material.

Best and Scott who are responsible for the preparation of insulin in the Insulin Division of the Connaught Laboratories have tested all the available methods and have appropriated certain details from many of these, several new procedures which have been found advantageous have been introduced by them. The yield of insulin obtained by Best and Scott at the Connaught Laboratories, by a preliminary extraction with dilute sulphuric acid followed by alcohol, is 1,800 to 2,200 units per kg. of pancreas.

The present method of preparation is as follows. The beef or pork pancreas is finely minced in a large grinder and the minced material is then treated with 5 c.c. of concentrated sulphuric acid, appropriately diluted, per pound of glands. The mixture is stirred for a period of three or four hours and 95 per cent alcohol is added until the concentration of alcohol is 60 to 70 per cent. Two extractions of the glands are made. The solid material is then partially removed by centrifuging the mixture and the solution is further clarified by filtering through paper. The filtrate is practically neutralized with NaOH. The clear filtrate is concentrated in vacuo to about one-fifteenth of its original volume. The concentrate is then heated to 50° C which results in the separation of lipoid and other materials, which are removed by filtration. Ammonium sulphate (37 gms. per 100 c.c.) is then added to the concentrate and a protein material containing all the insulin floats to the top of the liquid. The precipitate is skimmed off and dissolved in hot acid alcohol. When the precipitate has completely dissolved, ten volumes of warm alcohol are added. The solution is then neutralized with NaOH and cooled to room temperature, and kept in a refrigerator at 5° C for two days. At the end of this time the dark-coloured supernatant alcohol is decanted off. The alcohol contains practically no potency. The precipitate is dried in vacuo to remove all trace of the alcohol. It is then dissolved in acid water, in which it is readily soluble. The solution is made alkaline with NaOH to PH 7.3 to 7.5. At this alkalinity a dark-coloured precipitate settles out, and is immediately centrifuged off. This precipitate is washed once or twice with alkaline water of PH 9.0 and the washings are added to the main liquid. It is important that this process be carried out fairly quickly as insulin is destroyed in alkaline solution. The acidity is adjusted to PH 5.0 and a white precipitate readily settles out. Tricesol is added to a concentration of 0.3 per cent in order to assist in the isoelectric precipitation and to act as a preservative. After

standing one week in the ice chest the supernatant liquid is decanted off and the resultant liquid is removed by centrifuging. The precipitate is then dissolved in a small quantity of acid water. A second isoelectric precipitation is carried out by adjusting the acidity to a PH of approximately 5.0. After standing overnight the resultant precipitate is removed by centrifuging. The precipitate, which contains the active principle in a comparatively pure form, is dissolved in acid water and the hydrogen ion concentration adjusted to PH 2.5. The material is carefully tested to determine the potency and is then diluted to the desired strength of 10, 20, 40, or 80 units per c.c. Tricesol is added to secure a concentration of 0.1 per cent. Sufficient sodium chloride is added to make the solution isotonic. The insulin solution is passed through a Mandler filter. After passing through the filter the insulin is retested carefully to determine its potency. There is practically no loss in berkefelding. The tested insulin is poured into sterile glass vials with aseptic precautions and the sterility of the final product thoroughly tested by approved methods.

The method of estimating the potency of insulin solutions is based on the effect that insulin produces upon the blood sugar of normal animals. Rabbits serve as the test animal. They are starved for twenty-four hours before the administration of insulin. Their weight should be approximately 2 kg. Insulin is distributed in strengths of 10, 20, 40 and 80 units per c.c. The unit is one-third of the amount of material required to lower the blood sugar of a 2-kg. rabbit which has fasted twenty-four hours from the normal level (0.118 per cent) to 0.045 per cent over a period of five hours. In a moderately severe case of diabetes one unit causes about 2.5 grammes of carbohydrate to be utilized. In earlier and milder cases, as a rule, one unit has a greater effect, accounting for three to five grammes of carbohydrate.

With the improvement in the quality of insulin, the increased knowledge of its physiological action and the increased quantities at our disposal, we were now prepared for more extensive clinical investigation. In May 1922, a clinic was established in association with Dr. Gilchrist, at Christie Street Hospital for returned soldiers. Following this, a clinic was established in the Toronto General Hospital in association with Drs. Campbell and Fletcher, and at Toronto Hospital for Sick Children in association with Dr. Gladys Boyd. In general the routine followed in all these clinics was as follows.

After a careful history had been taken, the patient was given a complete physical examination. Special attention was directed to the finding of foci of possible infection. The teeth, tonsils, accessory sinuses, chest and digestive system were examined clinically, as well as by x-ray. Special consideration was given to biliary tract infection, constipation and chronic appendicitis. If any source of septic absorption was located it was appropriately treated, since such conditions may lower carbohydrate tolerance. If indicated the eye grounds were examined for a possible diabetic retinitis or neuro-retinitis. The daily routine urinalysis included the volume of the twenty-four hour specimen, the specific gravity, the reaction, and tests for albumen by heat or nitric acid. The acetone bodies were estimated by means of the Rothera and ferric chloride tests. Sugar determinations were done by means of the Benedict qualitative and quantitative solutions. In addition to the above, the blood sugars were estimated by means of the Schaffer-Hartman method and the respiratory quotients with the Douglas bag and Haldane gas analysis apparatus. At first the patient continued on the same diet as that previous to his admission to hospital in order to obtain some idea of the severity of his case, and to avoid complications from sudden change of diet. Coma will be discussed separately. On the second or third day he was placed upon a diet the caloric value of which was calculated on his basal requirement. This was determined from Dubois' chart and Aub-Dubois' table. It has been estimated by Marsh, Newberg, and Holly that the body requires two-thirds of a gram of protein per kilogram, (1 kilo = 2.2 pounds), of body weight per day, in order to maintain nitrogenous equilibrium. The remaining calories must be supplied by carbohydrate and fats in a ratio that will prevent the production of ketone bodies.

The patient remained on this basal requirement diet at least a week. During this time, blood sugar was estimated before, and three hours after, breakfast, in order to determine the fasting level and the effect of food. The quantity of sugar excreted was estimated daily, and

this amount subtracted from the available carbohydrate ingested gives approximately the utilization. The available carbohydrate includes fifty-eight per cent of the protein, ten per cent of the fat, and the total carbohydrate in the diet. It may be noticed that when a patient was placed upon a diet in which the protein, fat and carbohydrates were balanced, that the amount of sugar excreted soon approached a fairly constant amount, whereas if the diet was not well adjusted to the patient's requirements, there was wide variation in the amounts of sugar excreted. If a patient became sugar-free and blood sugar normal on a basal requirement diet the caloric intake was gradually increased until sugar appeared in the urine. The tolerance was thus ascertained. If a patient remained sugar-free and had a normal blood sugar when on a diet containing five hundred calories above his basal requirement he was not considered sufficiently severe for insulin treatment, since five hundred calories over and above the basal requirement are sufficient for daily activities. If, however, he was unable to metabolize this amount, insulin treatment was commenced.

Diabetes mellitus is due to a deficiency of the internal secretion of the pancreas. The main principle of treatment is, therefore, to correct this deficiency. If it is found that the patient is unable to keep sugar-free on a diet that is compatible with an active, useful life, sufficient insulin is administered to meet this requirement. In severe cases insulin was administered subcutaneously three times a day, from one-half to three-quarters of an hour before meals. This was done so that the curve of hypoglycæmia produced by the Insulin was superimposed on the curve of hyperglycæmia produced by the meal. In rare cases a small fourth dose was given at bed time to control nocturnal glycosuria. The less severe cases could be satisfactorily treated on a morning and evening dose or a single dose before breakfast. When the insulin treatment was established, if sugar was present in the twenty-four hour specimen of urine, the dosage was gradually raised till the patient became sugar-free. If he was not receiving sufficient food for maintenance, diet and dosage of insulin were gradually raised. If small quantities of urinary sugar persist, it was desirable to find out at what period of the day this was excreted. In order to do this, each specimen in the twenty-four hours was analysed separately. An increase in the dose previous to the appearance of glycosuria will prevent its occurrence.

In severe cases it was found preferable to give the largest dose of insulin in the morning, and reduced doses throughout the day. For example, a patient may receive fifteen units in the morning, ten units at noon and ten units at night. If three equal doses are given there may be morning glycosuria and evening hypoglycæmia, whereas the extremes of blood sugar causing these conditions may be prevented by the above distribution. The effect of the same dosage of extract on different individuals was found to vary considerably. Five patients, whose weights varied from forty-six to sixty-seven kilograms, each received two cubic centimetres of the same lot of Insulin, and in four hours the blood sugars had decreased 0.012 per cent, 0.044 per cent, 0.128 per cent, 0.146 per cent, and 0.0180 per cent respectively. It was found, however, that one patient would persistently give marked decreases in blood sugar after insulin, while in another the fall in blood sugar was persistently less. In our experience, the more marked decreases in blood sugar occurred in the milder cases. The blood sugars of some of the patients were followed throughout the twenty-four hours and it was found that it was possible to gauge the dosage of insulin so as to keep the blood sugar within normal limits and still avoid the dangers of hypoglycæmia.

Coincident with the maintenance of the blood sugar at normal level the cardinal symptoms of the disease disappear. The patient loses the irritating thirst and dryness of the mouth and throat, and does not desire the large amounts of fluid with which he had previously tried to combat these symptoms. The lowered fluid intake diminishes the polyuria and from a twenty-four hour excretion of three to five litres the output falls to normal. The appetite which has been voracious is now satisfied with a normal meal, the carbohydrate of which is utilized, and the patient loses the persistent craving for food.

We found that when a patient was given too large a dose of insulin there was a marked reaction, and the hypoglycæmia which developed gave rise to symptoms which were very similar to those observed in animals. The reaction began in from one and a half to six hours after

the patient received the overdose. The average time was three to four hours. The interval varied with the individual, the dosage, and the food ingested. The first warning of hypoglycæmia was an unaccountable anxiety and a feeling of impending trouble associated with restlessness. This was frequently followed by profuse perspiration. The development of this symptom was not affected by atmospheric conditions. It appeared while the patient was in a frosty outside atmosphere, or in a heated room, and was independent of physical or mental activity. At this time there was usually a very great desire for food. No particular foodstuff was desired, but bulk of any kind seemed to give satisfaction. At times the appetite is almost unappeasable.

At this stage of the reaction the patient noticed a certain sensation as of clonic tremor in the muscles of the extremities. This could be controlled at first. Coordination, however, was impaired for the more delicate movements. Coincident with this there was a marked pallor of the skin with a rise in pulse rate to one hundred or one hundred and twenty beats per minute, and a dilatation of the pupils. The blood pressure during this period fell about fifteen to twenty-five millimetres of mercury, and the patient felt faint. The ability to do physical or mental work was greatly impaired. In a severe reaction there was often a considerable degree of aphasia, the patient having to grope for words. The memory for names and figures became quite faulty.

The onset of hypoglycæmic symptoms depends not only on the extent, but also on the rapidity of fall in blood sugar. The level at which symptoms occur is slightly higher in the diabetic with marked hyperglycæmia than in a patient whose blood sugar is normal. When the blood sugar is suddenly reduced from a high level, premonitory symptoms may occur with a blood sugar between the normal levels of 0.100 per cent and 0.080 per cent while the more marked symptoms of prostration, perspiration, and incoordination develop between 0.080 per cent and 0.042 per cent. As a patient becomes accustomed to a normal blood sugar the threshold of these reactions becomes lower. One patient who formerly had premonitory symptoms of hypoglycæmia at 0.096 per cent now has no reaction at 0.076 per cent but symptoms commence between this level and 0.062 per cent. The ingestion of carbohydrate, in the form of orange juice, (four to eight ounces), or of glucose, relieves these symptoms in from one-quarter to one-half hour. If the reaction is severe, or if coma or convulsions occur, epinephrin or intravenous glucose should be given. The former acts in from three to ten minutes, but in order that the symptoms should not recur glucose must be given by mouth as soon as the patient has sufficiently recovered. The patients were warned that when these reactions occurred they were to obtain carbohydrate immediately.

"Fats only burn in the fire of carbohydrate." The ability of the severe diabetic to burn glucose is markedly impaired, therefore the excess of fat is incompletely oxidized, giving rise to ketone bodies. These appear in the blood and urine as acetone, diacetic and betaoxybutyric acids. Insulin causes increased carbohydrate metabolism, and consequently fats are completely burned. This is substantiated by the fact that acetone and sugar disappear from the urine almost simultaneously following adequate amounts of insulin. When insulin is discontinued in these cases, acetone bodies and sugar reappear in the urine.

Since the Rothera test is exceedingly delicate, (sensitive to 1 part of aceto-acetic acid in 30,000), patients on a high fat diet may be sugar-free and still show traces of acetone bodies. A comparison with the ferric chloride test, (which is sensitive to only 1 part in 7,000) is, therefore, desirable. The persistence of ketone bodies in amounts which can be determined by the ferric chloride test necessitates either an increase in the carbohydrate or a decrease in fat of the diet.

When the production of acetone bodies is more rapid than the excretion they accumulate in the blood, giving rise to air hunger, drowsiness, and coma. The need of insulin is then imperative. After its administration the utilization of carbohydrate by the body gives complete combustion of the fats. When a patient was admitted to hospital in coma the blood sugar tests and a urinalysis were done as soon as possible. (The urine was obtained by catheterization if necessary.) While these tests were being carried out the large bowel was evacuated with copious enemata. If the blood sugar was high and acetone present in large amounts in the urine, from thirty to fifty units of insulin were

given subcutaneously. Blood and urinary sugar were frequently estimated because of the danger of hypoglycæmia. To prevent this from thirty to fifty grammes of glucose in ten per cent solution were given intravenously. If the patient was profoundly comatose the insulin was administered intravenously with the glucose.

The patient usually regained consciousness in from three to six hours. From this time on, fluids and glucose were administered by mouth if retained. The patient was urged to take at least two hundred cubic centimetres of fluid per hour. In from eight to ten hours the ketone bodies were markedly reduced. On the following day protein was given every four hours as the white of one egg in two hundred cubic centimetres of orange juice. In two to three days, when ketone bodies had disappeared from the urine, fat was cautiously added, and the patient was slowly raised to a basal requirement diet. He was then treated as an ordinary diabetic. During the period of coma the patient was kept warm and toxic materials eliminated from the bowel by purgation and repeated enemata. A large amount of fluid was given to dilute the toxic bodies and promote their elimination. This was administered intravenously, subcutaneously, or per rectum. If signs of circulatory failure developed these were treated by appropriate stimulation.

Striking results were obtained with the above procedure. However, it was found that the longer the period of untreated coma the more grave was the prognosis and the slower the recovery if it occurred. Cases complicated by severe infection, gangrene, pneumonia, or intestinal intoxication may recover from acidosis and coma, but succumb to the complication. Marked lipæmia was present in three cases. This disappeared in the course of a week to ten days after the patient was placed on insulin and on a diet in which the fat was restricted. The urine of one patient became acetone-free while lipæmia persisted.

The severe diabetic, whose ability to burn carbohydrate is markedly impaired, has a persistently low respiratory quotient, from 0.7 to 0.8, which is but little raised by the ingestion of glucose: when glucose and insulin are given together the respiratory quotient is markedly increased, showing that carbohydrate is being metabolized. The highest values have been obtained when pure glucose was used with insulin. Less extensive rises have been secured when the patient, while on a mixed diet, received insulin. All the patients gained in weight on the additional calories. There was an increase in sexual vigour and there was a greater ability to do mental and physical work. Nearly all of the patients have returned to their former employment, and while still under supervision, they administer their own insulin and arrange their own diets with satisfactory results.

All diabetics who have not an adequate knowledge of the dietetic treatment of their disease should be admitted to hospital in order that they may receive instruction in the preparation of their calculated and weighed diet—that they may learn the qualitative tests for sugar and acetone in the urine — that their carbohydrate tolerance may be accurately determined; and that the use of insulin, if required, may be safely instituted. Mild cases, especially if over fifty years of age can be controlled by diet. Cases that cannot be adequately controlled by dietetic treatment alone should be given sufficient insulin to enable them to attain to a diet on which they may "carry on."

One of the commonest complications of diabetes especially in untreated patients over fifty is gangrene. It is often associated with varying degrees of sclerosis of the leg arteries, which makes it extremely difficult to obtain healing. This may be accomplished by the use of insulin, but when permanent impairment has occurred it is advisable to amputate. Amputation is also advisable when an infection is so severe that the life of the patient is in jeopardy. Treatment of these cases is difficult because, due to the infection, there is a marked variation in the daily production of insulin by their own pancreas. But with careful treatment they can be rendered free from acetone and sugar and their general condition improved. Operation is then performed preferably under nitrous oxide and oxygen anæsthetic. If the blood sugar is maintained normal and acidosis is prevented the wound heals kindly, provided that the amputation has been high enough to assure a good blood supply. For varying periods after the operation the patient remains on insulin treatment. In nearly all cases at the end of three or four weeks mild hypoglycæmic reactions indicate an overdose of insulin. It is

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then necessary to increase the diet or decrease the insulin. In some cases the tolerance improves sufficiently to warrant the discontinuance of insulin.

Diabetic patients requiring major operations, such as appendectomy, cholecystectomy and tonsillectomy, or removal of teeth, are first rendered sugar and acetone-free unless the severity of symptoms demand immediate attention. Patients formerly considered bad surgical risks, if given proper dietetic treatment with insulin may be protected from the acidosis, hyperglycæmia and glycosuria which otherwise usually result from the anæsthetic. In the diabetic, infections such as boils and carbuncles and also intercurrent infections such as bronchitis, influenza, and fevers are favourably influenced by the normal blood sugar and increased metabolism which the administration of insulin permits. In the diabetic with tuberculosis insulin allows the administration of proper nourishment to combat the tubercle infection.

During the past year and a half I have not been in active practice but have remained associated with the clinics. I have also kept in personal touch with the first fifteen patients who received insulin treatment. These patients were all extremely severe diabetics for whom diet had done its best. Of these fifteen patients seven were children under fifteen years. It has been possible through the intelligent co-operation of the parents to continue a proper balance between diet and insulin dosage and to maintain six of the seven children sugar-free. None of these have had to return to hospital, and all have gained in tolerance and require from one-half to one-third less insulin than when they first began treatment. They have all gained in height and weight and for the most part have developed into healthy normal children. The one child whose diet and insulin has not been properly controlled has been back in hospital repeatedly and is steadily losing in tolerance. Of the remaining eight cases there were four women and three men whose ages ranged from twenty-five to thirty-five years. The weight of the women varied from seventy-four to seventy-nine pounds. Two of the women, although they have gained to normal or overweight and now have no symptoms of disease, have not shown any increase in tolerance, due perhaps, to the fact that they have not kept sugar-free. All the others, both men and women, have been able to reduce their dose of insulin from two-thirds to one-fifth of the original requirement. The one remaining case was admitted for amputation. She had had diabetes for six years, and at the time of admission her blood sugar was 0.350 per cent and large amounts of acetone and sugar were being excreted in the urine. She was rendered sugar- and acetone-free by means of insulin before the operation was performed. Amputation was done at the middle third of the thigh. The stump was entirely healed in three weeks. Within six weeks of her operation insulin was discontinued and her diet was increased without the return of diabetic symptoms. It is now three years since her operation and she is sugar-free on a liberal diet without insulin.

It may be of interest to mention a few cases in greater detail to further illustrate the improvement in carbohydrate tolerance following insulin treatment.

Case 1.—Male, aged twenty-nine years had suffered from chronic appendicitis. The urine of the patient in December, 1916, was sugar-free. About the middle of March, 1917, he suddenly developed polyuria, polyphagia and polydipsia, and lost fourteen pounds in weight in a fortnight. There was marked weakness. Urinary sugar was discovered to be as high as eight per cent at this time. On April 4th, the patient was placed on Allen treatment, and slowly regained a tolerance of about two hundred grammes available carbohydrate. He returned to his army duties in September 1917, and was able to carry on uninterruptedly until March, 1919. His tolerance had decreased during this time to about one hundred and fifty grammes. Following discharge from the army in March, 1919, the course of the patient was slowly downhill until October, 1921, when a particularly severe form of influenza shattered his tolerance. Up to this time the patient was maintained practically sugar-free, but following the attack of influenza his tolerance fell to about sixty-six grammes of available carbohydrate. He began to lose weight rapidly. Thirst, hunger and polyuria returned. His strength diminished and, owing to mental and physical lassitude, he found it impossible to continue his work. Glycosuria became persistent and acetone bodies made their appearance and steadily increased. A distinct

odour of acetone was at times distinguishable on the patient's breath.

On February 11, 1922, this patient was taken to the Physiology Department of the University of Toronto, and the respiratory quotient was found to be 0.74, and unchanged by the ingestion of thirty grammes of pure glucose. Then 5 c.c. of insulin were given subcutaneously, and within two hours the patient's respiratory quotient had risen to 0.90. The urine was sugar-free and he had shaken off his mental and physical torpor. Following this experiment the patient did not again receive insulin until May 15th, as the product was being further improved. Since the latter date, the patient has been constantly on insulin.

During the first six months of insulin treatment it was impossible to maintain him sugar-free, although he received about 120 units per day. However, he gained in weight and his clinical condition improved. About January 1923 with the improvement in the quality of insulin, the patient became sugar-free and has remained sugar-free with the exception of one or two occasions. During the first nine months he required no reduction in the dose of insulin, but since that time on the average of every two months he has had a series of hypoglycæmic reactions which necessitated the reduction of the dose. One exception to this occurred in June 1924 at which time appendectomy was performed following a mild attack of appendicitis. An increased dose was required to maintain him sugar-free during this period. At the present time he requires but 20 units of insulin, or one-sixth of his original requirement. His diet has been practically constant during the whole period of observation. All symptoms attributable to diabetes have long since disappeared. He has gained twenty-five pounds in weight and apart from the necessity of taking insulin and controlling his diet he leads an active normal life.

This case is a striking example of the fact that it is only in cases who are maintained sugar-free over long periods of time that an improvement in tolerance is obtained with a consequent reduction in the dose of insulin.

Case 2.—Female, age fifteen years. In the autumn of 1918 the patient had polydipsia and polyuria and complained of weakness. During the winter she suffered from pains in the legs and back and from insomnia. In March, 1919, these symptoms became more severe. The appetite became excessive and there was some pruritus. The weight by this time had fallen from seventy-five pounds to sixty-two pounds. Glycosuria was discovered and she was placed under the care of Dr. F. M. Allen, to whom we are very much indebted for complete record of the case from April 1919 till August 1922. During this period the diet was controlled so as to maintain the urine free from sugar. Despite this careful dietetic regime the patient's condition became progressively worse.

When she came under my care on August 16, 1922, the examination showed patient emaciated; skin dry; slight œdema of ankles. Hair brittle and thin. Abdomen prominent. Marked weakness. The patient was brought on a stretcher and weighed forty-five pounds. Nothing of note in the respiratory, cardiovascular, digestive or nervous system.

At this time she was receiving a diet of protein 50 gm., fat 71 gm., carbohydrate 20 gm. (919 calories). Insulin treatment was started immediately. At this early stage the unit of insulin had not been worked out and it is therefore difficult to accurately estimate the dosage she received. The diet was increased daily so that, at the end of two weeks, she was receiving protein 63 gm., fat 208 gm., carbohydrate 97 gm., (2512 calories). This diet was continued up to January 1, 1923. Insulin was given fifteen to thirty minutes before the morning and evening meals. A sufficient amount was given to maintain the urine free of sugar. Each specimen of urine was examined and the dose was increased slightly if traces of sugar appeared. When hypoglycæmia occurred orange juice or glucose candy was given. Between August 16th and January 1st, the urine was sugar free except on ten occasions when traces of sugar appeared, and on two other occasions when less than 2 gm. was excreted. Acetone was absent from the urine.

On this treatment the patient gained rapidly in strength and was soon able to take vigorous exercise. Her weight increased from forty-five to one hundred and five pounds in the first six months. The diet included such foodstuffs as cereals, bread, potato, rice, corn, tapioca, corn starch, and even honey.

At present (June 1925) she is in the best of

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health and to use her own words "never felt better in all my life." She has grown four inches and weighs one hundred and thirty-four pounds. Her present diet which is only approximate because she has dispensed with the weighing of food, is 125 gm. carbohydrate, 50 gm. protein, 50 gm. fat. This diet is practically the same as that of December, 1922. The insulin required to maintain her sugar free has been reduced about one-third.

Dr. Gladys Boyd, who is now in charge of the diabetics at the Hospital for Sick Children, Toronto, has been able to follow a number of cases of children under insulin treatment. She has estimated the insulin requirement per 10 gm. of carbohydrate in a number of cases and in general her results show a decided increase in tolerance in all cases in which glycosuria and hyperglycæmia are adequately controlled. To illustrate—Case 1, which required 6.9 units per 10 gm. carbohydrate in March 1923, only required 2.6 units in January, 1924. Case 2 ,which required 7.8 units per 10 gm. in January, 1925, in June 1925, required only 2.8 units. Case 3, which required 6.5 units per 10 gm. in April 1922, required only 3.7 units in January 1925.

From a review of the work Dr. Boyd has found that all the patients had had hyperglycæmia or even glycosuria at times, but if such occurrences were only transitory and infrequent, improvement in tolerance occurred. Even short periods of rest to the pancreas by means of balanced diet and insulin resulted in improvement in tolerance. Two of our earliest cases, Fanny Z. and Elsie N. are the only exceptions to this rule. Fanny is to all appearances in the best of health with a blood sugar of 0.3 per cent to 0.4 per cent. She has been admitted in coma four times. During her stay in the hospital she improves but does as she chooses on discharge. Her tolerance is becoming less all the time. Elsie keeps in touch with us but is looked after by another physician. He purposely allows her to have glycosuria at night. She is fine physically, but requires much more insulin than formerly.

Dr. Boyd has also found that in those cases who can handle sufficient food without insulin, although the disease has been kept under control there has not been such striking increase in tolerance. The best evidence that there is regeneration of the pancreas with insulin treatment is provided by Drs. Boyd and Robinson. The following is the case reported by them.

Clinical History: B. N. white, male, aged nine years. Family History: Father and one maternal uncle have diabetes. Diabetes diagnosed in this child when he was two years old. He was placed on a suitable Allen diet, which was strictly adhered to, and for a time did well except for recurrent attacks of dysentery, which lowered his tolerance. Failure to gain in stature or weight in any way commensurate with his age was noted and the general condition became worse each year until he was more or less a chronic invalid with increasingly frequent attacks of acidosis during the last year before starting insulin.

He was admitted to the Hospital for Sick Children, Toronto, the end of December 1922. At this time he was an emaciated dwarf, more or less drowsy and unhappy. His weight was thirty pounds, and his height thirty-nine inches. His tolerance to carbohydrate had decreased until he was unable to utilize 15 gm. of such food. Insulin treatment was started at once and his diet increased to a diet suitable for a boy of his age. Sufficient insulin was given to keep him sugar-free and his blood sugar normal. He was discharged on an adequate diet plus insulin. Progress both in general condition and in improvement of pancreatic function was steady. His tolerance to carbohydrate trebled in the year as shown either by the fact that 30 units of insulin controlled the disease as adequately as 90 units a year before, or, stated in another way, without insulin he could now handle 54 gm. of carbohydrate instead of 15. From a chronic invalid in 1922 he became "the leader of the gang" in 1923. He was killed by fracturing his skull when sleigh-riding. He lived for about three hours after receiving the injury and an immediate post-mortem examination was made. The pancreas was removed within thirty minutes of death.

From this clinical history one might expect the pancreas to show marked degeneration. However, on section there was little sign of degeneration, but on the other hand there was strong evidence to support the view of active regeneration both of acinar and islet tissue. These regenerative changes were more marked in the periphery and smaller lobules of the pancreas than in the central area.

The acinar cells were found to be actively proliferating in cords and clusters forming small lobules in some areas and were in close association with newly formed functioning ducts.

The islets were greatly increased in number, particularly in the periphery, there being about four times as many per field as in the central area. These cells were large but might be overlooked with an ordinary stain. However, they could be identified as islet cells by Bowie's special granule stain. This stain also demonstrated that these cells were almost entirely beta cells and were probably concerned in the increased carbohydrate tolerance. On the other hand those islets in the central areas showed an increased number of cells all in an active state of nutrition, but closely packed together. The special stain showed a normal ratio of alpha and beta cells.

These sections were studied by Bensley, Opie, Allen and others who concurred in the opinion of Drs. Boyd and Robinson. Dr. F. M. Allen, Morristown, N.J., after using insulin for three years states as his belief, "That there has been improvement of tolerance in some cases beyond what was possible without insulin." "This observation is trustworthy only in cases where prolonged strict control of symptoms by diet was previously employed. On the other hand the marked increase of tolerance is limited to a minority of cases and has not proved to be continuous in any of them. In other words the improvement always stops short of a cure. There is certainly no decline of tolerance with the passage of time provided the case is kept under proper control."

This summary is the belief of the most conservative of the outstanding clinicians in the United States engaged in diabetic work on a large scale.

Dr. E. P. Joslin, Boston, Mass., who has one of the largest diabetic clinics in the world, has also found that, "The diabetic who is able to reduce his insulin is the diabetic who is absolutely faithful to diet and restricts gain in weight to a moderate degree."

Joslin and his associates have carefully analysed the gain in weight and height of their thirty-two diabetic children under fifteen years of age. Their conclusions are:

1. The gain in weight of the diabetic child treated with insulin resembles that of the normal child, but the diabetic child is still under weight for his age, though often not for his height.

2. The increase in height of the diabetic child treated with insulin, though occasionally normal, is usually below that of the normal child. So far he has not grown tall like the normal child, either at the expense of growing thin or while being well nourished.

Of the one hundred and thirty children treated with insulin one hundred and twenty are still living, while of the one hundred and sixty-four who did not receive insulin there are one hundred and fifty-two dead. Of the one hundred and twenty still living forty per cent have either not increased or have actually decreased their insulin. Dr. Joslin believes that if the sixty per cent who have had to increase their insulin had received similar treatment they too would have been able to reduce their insulin.

Sixteen children under ten years of age who have taken insulin under Dr. Joslin's care for an average of two years are all alive and now their duration of life is more than three times the duration of life of diabetic children of similar age treated by Dr. Joslin prior to 1915.

Regardless of the severity of the disease, it has been found that by carefully adjusting the *diet and the dose of insulin, all patients may be artificially administered insulin.* In fact, it is to be strongly advocated, because we have abundant evidence for the belief that there is *regeneration of the islet cells of the pancreas* when the strain thrown upon them by a high blood sugar is relieved. The *increase in tolerance* is evidenced by the *decreasing dosage of artificially administered insulin. In fact, in some moderately severe cases,* the tolerance has increased sufficiently that they no longer require insulin.

Diabetes mellitus may be considered fundamentally as a *disordered metabolism, primarily of carbohydrates,* and *secondarily of protein and fat.* It is indisputably proven that for normal metabolism of carbohydrate in the body, adequate amounts of insulin are essential. It follows, therefore, that the treatment consists in giving just sufficient insulin to make up for the deficiency in the patient's pancreas. Insulin enables the severe diabetic to burn carbohydrate as shown by the rise in the respiratory quotient following the administration of glucose and in-

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sulin. It permits glucose to be stored as glycogen in the liver for future use. The burning of carbohydrate enables the complete oxidation of fats, and acidosis disappears. The normality of blood sugar relieves the distressing thirst and consequently there is a diminished intake and output of fluid. Since the tissue cells are properly nourished by the increased diet, there is no longer the constant calling for food, hence *hunger pain* of the severe diabetic is replaced by *normal appetite*. On the increased caloric intake, the patients *gain rapidly in strength and weight*. With the relief of the symptoms of his disease, and with the increased strength and vigor resulting from the increased diet, *the pessimistic, melancholy diabetic becomes optimistic and cheerful*. Insulin is not a cure for diabetes; it is a treatment. It enables the diabetic to burn sufficient carbohydrates, so that proteins and fats may be added to the diet in sufficient quantities to provide energy for the economic burdens of life.

Crystalline Insulin—Another Chemical Triumph.—One of the greatest fields of effort study and preparation of pure principles of the for the constructive chemist is the isolation, organs of internal secretion. An understanding of the action of the important glands in the body is never adequate until the chemistry of the active principle (or principles) is known. Although Schäfer and Oliver, Szymonowicz and Cybulski had noted the presence of a vasoconstrictor principle in the suprarenal glands, the fuller appreciation of the secretion came after Abel had succeeded in isolating epinephrine. Subsequently, its chemical structure was determined and the product prepared synthetically, and the science of the therapeutics has been benefited immensely by the availability of pure solutions of definite composition.

The researches of E. C. Kendall leading to the isolation and identification of thyroxin have given new insight into the action of the thyroid; like epinephrine, the pure substance is at the disposal of the physician. The artificial preparation of thyroxin is only a question of time and effort, and "one more outpost of the bulwarks of life will thus have been conquered by the chemist." The extract from the pituitary gland is still the subject of attack; steady progress leading to separation and isolation of the pure substance is attested by the reports of Abel and others who have obtained extremely active solutions. The attack on the ovary, particularly the work of Doisy, lends hope that, even for this gland, chemistry will throw much light on its functions as a secretory organ. Following the fundamental researches of others, Collip has succeeded in preparing a solution from the parathyroid containing some substances of marked effect on calcium metabolism. A close parallel to the history of epinephrine is that of insulin. The far-reaching publications of Banting, Best and their coworkers on the preparation and use of active extracts of the pancreas are still fresh in our minds. Pharmaceutic houses have been constantly improving the product; yet none has been unconscious of the presence of undesirable impurities of the fact that the methods of standardization at best indicate only approximately the relatively minute amount of that chemical which is the ultimate goal.

In a significant address—the sixth annual Pasteur lecture—recently given before the Chicago Institute of Medicine, John J. Abel made public announcement that he had obtained a crystalline form of insulin and exhibited a small specimen of the product. Lantern slide pictures showed the crystals to be rhombohedral, but other data were not presented at that time. The chemical and medical world will await with great interest further developments, particularly the proof of the identification and chemical constitution of the product. The crystallization of the pure principle "insulin," or a compound of it, may well be considered an outstanding accomplishment in the life of a man already distinguished by his conquests in biochemistry. If following this a better method of standardization is worked out, and the product can be prepared synthetically it will have contributed in great measure to the better understanding of modern physiology, to the increased value of medicine, and to a more enjoyable and prolonged life of the patient with diabetes.—*Jour. A. M. A.*, Jan. 30, 1926.

An Address

THE HOSPITAL—ITS LONG CRUSADE *

By W. W. Chipman

Montreal

Mr. President, Dr. Graves, Ladies and Gentlemen.—

TO-DAY is your Fiftieth Anniversary. We celebrate to-day your Golden Year—the Jubilee, if you will, of this Institution.

May I first congratulate you, trustees and staff alike, upon the great success of your achievement. Golden opinions you deserve, and golden opinions you certainly have won, on this your Golden Day. And while the reapers reap, they should never be unmindful of the labour that went before, of those who did the sowing; and we gladly remember to-day the sacrifice and the devotion dedicated to this hospital from the beginning. We remember this, and I thank you for the honour of sharing this special year in your great harvest.

The Free Hospital for Women was founded fifty years ago, a Memorial in all truth to the life and labour of its founder, Dr. William H. Baker.

The Hospital and the Man, and, preceding these, both in Hospitals and Men, there has been in your three hundred years, a long line of succession—a long line, in this famous city of St. Botolph.

A long line in this succession, and may I first draw, very shortly, the setting of your city's early effort.

St. Botolph, you remember, Patron Saint of Sailors, founded a Monastery in England, in Lincolnshire, and hence the name of Botolph's Town, or Boston. Many years transpired—ten centuries or so—and from this same Boston came the Lady Arbella, the daughter of the Earl of Lincoln, with her husband, Isaac Johnson; came in the good ship *Arbella*, to Massachusetts' Bay, and it was in honour of their native town that this place was named.

And these fathers and these mothers were a robust folk, concerned with many things for their minds' and conscience' sake. No wonder that there soon appeared that 'Plantation,' three miles up the Charles' River, called at first 'New Towne,' and then Cambridge; and a Public Tax for the erection there of a School or College for the education of "the English and Indian youth of this country in knowledge and Godlyness." And then in 1638, came the untimely death of the Rev. John Harvard, a Master in Arts of Emmanuel College, Cambridge, who, dying in Charlestown, Mass., left half of his Estate, about eight hundred pounds, his library, and his name to this early seminary in the wilderness. They were a robust folk, and yet here in Boston you remember, nearly three hundred years ago, practised those famous physicians, Giles Firman, Samuel Fuller, and John Winthrop; they not only practised medicine, but they also preached the Gospel, exemplifying in this way a true 'angelical conjunction,' to use the famous phrase of Cotton Mather. We read that Giles Firman was here our first medical teacher, as usual underpaid, for, in a short time he took Orders, finding Physic but a "meane help." The biographer assures us that these were men of sterling worth, and—a delightful tribute—were possessed "of constant if not warm affections."

And so these 'constant' men, these men and their 'apprentices,' practiced medicine in Massachusetts. Hospitals there were none, save here and there an adapted private house, for it was nearly a hundred years, in 1717 in fact, before the first hospital in Boston, one for infectious disease, was founded. Your fair city grew apace, and the Medical School at Harvard was opened in 1782. And during all these years there have arisen here distinguished names, almost an Apostolic Succession, until to-day, both in Hos-

* Delivered on November 4, 1925 on the celebration of the Fiftieth Anniversary of The Free Hospital for Women, Brookline, Boston, Mass.

pitals and men, Boston remains, as always, a celebrated city.

And we are here this afternoon, in this Free Hospital, which is in every sense, a modern one. And in this New World, and on the latest day of our own century, we can realise how far mankind has travelled in the healing of the sick; that it is indeed a far cry backward to the earliest hospitals of the world; to the Asclepeia of the Greeks; to the primitive Bethesda of the Scriptures; the *Hospitium* of Ancient Rome; or even to the *monastic Hospitalia* of the Middle Ages. In all truth it may be said that it is a wise child that is born to-day. And of hospitals it may be told that it has been a long crusade.

In a very true sense, I believe that a hospital may be considered as the measure of the civilization, not only of a community or a city, but even of a nation or a people. How do we treat the sick and the afflicted? Are we in any practical way our brother's keeper! In its answer to this question Boston need feel no shame, for as Carlyle puts it, "What you are thunders so loud that I can't hear what you say."

The Hospital and its great Crusade—its age-long Crusade—against misery and disease. Life is a continual struggle in adaptation, a struggle against death and the hospital is the outpost, the fortified outpost, in this conflict. And in my judgment, so it will always be.

It is undoubtedly true that the story of medicine really includes and embraces the whole history of mankind. For the 'Know thyself,' the behest of the Delphic oracle, was in reality only the impassioned cry of the human race become at last articulate. This knowledge of self, this understanding of ourselves, mental, moral, and physical, as we arbitrarily divide it, is related fundamentally to the study of medicine. It is only by means of this study that we can 'know ourselves,' and through ourselves the world outside and beyond us. This *medical* self-knowledge is, in fact, the beginning; and so it must be to the end, that true science and true religion go hand-in-hand, for they are one and indissoluble. In the long exodus of the human race, "from out the night, the blinding night" of ignorance and superstition, these are the agencies that have been at work. They are at work in the struggle of to-day, in the person of the priest, the philosopher, the philanthropist, and the physician. There can be no earthly reason why the several attributes of these should not frequently be found united in the one individual. A counsel of perfection if you like, and yet to a greater or a less degree, they must be embodied in the person of every true physician.

The history of medicine is really the narrative of man's struggle to survive; to become and to be master of himself and his surroundings; the arbiter of his own destiny. To attain and to preserve a sound mind in a sound body is the very crux of the conflict. Disease and death are on every side, and in consequence this effort of life is a strenuous and unremitting one. It is indeed a long crusade, to meet, to subdue, and to prevent disease; and the Hospital has always been a rallying-point, a rock of shelter as it were, or even a fortification in this great campaign.

From the beginning the hospital has been in a true sense a Guest-House. (Few of us are born perfect, or lead perfect lives.) And its function is the three-fold one, to heal, to teach, and to discover. This was the effort long ago, in the earliest hospitals of the world; and it is still the effort, even with our most modern methods. As you know, we 'standardise' to-day, not only the hospitals but the crusade itself. In our 'approved hospitals' there are, you remember, the three avowed activities; an organised staff to heal the sick; an accurate record of the whole transaction, by means of which we gain experience and by the help of which, we teach, teach ourselves and our students; and then there are the associated laboratories which enable us to prosecute research, and to discover.

The work of the hospital may be divided in this three-fold way, and it is in this three-fold way that we face the future. Immediately before us lies a new world—or a new phase of the old one—the world of Preventive Medicine, a new world to conquer, with a new strategy and new tactics. How true it is that sanitation will take its place among the great revolutions of the world; sanitation, and its accompanying hygiene, physical, mental, and moral; and with this, the affiliated undertaking of social service! Already have we seen partly fulfilled the famous prophecy of Descartes that

"we could be free from an infinity of evils—if we had sufficient knowledge of their causes, and of all the remedies with which Nature has provided us." We live to-day in the very midst of this, and the hospital, as ever, is the rallying-point; as ever, the nucleus of the movement.

May I now say a special word of Social Service?

This is a popular and most important aspect of Preventive Medicine, a world-wide attempt to keep the people better, and to make the world a happier place to live in. A general 'Welfare' is the slogan of the movement, and the attempt is towards a 'social uplift,' if you like that term.

Naturally enough, it is the two extremes in the economic scale that are most in need of reformation. At one extreme there are the poor, they are always with us; and farthest removed from these, there are the rich, I mean, the idle and luxurious rich. The effort should always be to establish between these two extremes a better adjustment or a proper balance. Among the poor it is largely a question of the living wage, and, having scarcely bread to eat, there is little else in all their lives save the daily struggle to escape starvation. While among the rich, I say again, the idle, thoughtless rich, satiety early writes its wrinkles upon the blasé and discontented face. Social service, if it means anything and is to become anything, must bring these two extremes together. The rich and the poor must meet, and in this meeting gain for themselves a mutual salvation.

Underlying it all is the basic problem of economics, aggravated by the various complexities of our modern life. It is no easy problem. What is to be said of the conditions of our urban, or even of our rural life; the great industrial problem; the housing problem; the overcrowding of the cities; the standard of living, and the living wage? Perhaps among the most urgent of these questions is the welfare of the women and the children. Ruskin has told us that by what it makes of its girls—its young women, its potential mothers—a civilization may be judged. And apropos of this, may I quote to you O. Henry's story, his "Unfinished Story" as he calls it, the story of the salesgirl Dulcie, in the city shop. Here you remember, he dreamed a dream that when Gabriel blew his horn, an angel-policeman seized him by the wing. "Do you belong with that bunch?" asks the policeman, pointing to a group of prosperous-looking spirits, awaiting judgment. "Who are they?" the dreamer said. "Why," replies the policeman, "they are the men who hired working-girls and paid them five or six dollars a week to live on. Are you one of the bunch?" "Not on your immortality," the dreamer answers, "I'm not so bad as that. For in my life I only set fire to an Orphan-Asylum, and murdered a blind man for his pennies." This story of Dulcie clearly illustrates the slave-like conditions that are sometimes found in our city-life. Here a social service is really social economics; and, rightly enough, the work therein belongs to Preventive Medicine. For, under such conditions disability and disease are an inevitable sequence. And it is with the therapeutic aspect of this philanthropy that the hospital is closely concerned.

Will you forgive the following enunciation?—it is true. Could we but segregate the feeble-minded and eradicate venereal disease a full half of our social troubles would be cured at the beginning. And this must be done. It will be done when, at the long last, we call a spade a spade, and an ostrich-like complacency is replaced by common-sense.

In this year of Grace, the Hospital is in the very midst, perhaps only at the beginning of its long crusade. For we are told that the country whose inhabitants shall not say, "I am sick," is exceeding far off.

It is a great pleasure to add a few words concerning this hospital, the Free Hospital for Women. It is rather a wonderful history, as Dr. Graves has outlined it, this history of Fifty Years. Truly, there was a small beginning, a private house with five beds. Last year there were admitted to your hospital 1504 patients, while there were 6,735 consultations, in your Out-Patient department. Five beds, and then after fifty years, this record of service! It is very evident that this institution has been fortunate in its friends, and especially fortunate, may I say, in its Executive and in its Staff. Dr. Baker was its chief surgeon for thirty years, then followed Dr. Edward P. Reynolds,

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and for the past seventeen years, Dr. William P. Graves. To these I add the name of your Assisting Visiting Surgeon, Dr. Frank A. Pemberton; and I gladly express my admiration of the Service, the long Service and devotion, of your Superintendent, Miss H. J. Ewin. I repeat, that you have been extremely fortunate in your Staff.

The year 1911 was for you a memorable year, for at that time Dr. Graves was appointed Professor of Gynecology at Harvard, and this hospital was definitely affiliated with this distinguished Medical School. In other words, it became a Teaching Hospital, and found itself endowed by the inspiration and the stimulus that pertained to a Teaching School.

As I have said, you have been extremely fortunate in your Executive. The nature and the number of your donations attest to this; for these bespeak a general and wide-spread confidence in the work you do. Of special interest perhaps, is your Board of Lady Visitors, a Board that from the first had been warmly interested in the work of this Corporation. It is natural that women should be interested in women, and that they should possess a special aptitude in ministering to the comfort of an Institution. And then, a Committee of Women the world over is always possessed of money, or can collect it; for theirs is the inevitable gift of a sound every-day finance.

You may remember the old aphorism of the Duchess of Burgundy:—"The times are happy when women rule, for then men may more easily direct the policy." Fortunately for us all, there is something of a truth in this, whether the ruling be a kingdom or a Hospital.

Ladies and Gentlemen, I congratulate you on this anniversary. Already your Hospital has taken its place in the vanguard of the Great Crusade.

Bacteriophage News.—There is a fascinating aspect to the conception that bacteria are subject to enemies within their own camp. Mankind has been industrious in devising ways of destroying the harmful micro-organism by a great variety of devices. Chemical as well as physical agents have been requisitioned in this bitter warfare; and when there has been no adequate kind of ammunition devised or available, defensive barriers have been erected. Antisepsis has vied with asepsis as a protective device. There can be no cessation of activities, for the menace is ever present and seizes every advantage of laxity on the part of the armies of preventive medicine. Lack of preparedness invites momentary human disaster. In the midst of this tension has come the news of the bacteriophage, the reputed discovery of a filtrable, ultramicroscopic virus, parasitizing on and destroying actively growing, susceptible bacteria. Such a prospect of unsuspected potent help has been hailed with interest and enthusiasm not only by the scientist but also by the layman. Sinclair Lewis gave it publicity as a leading theme in the much discussed novel *Arrowsmith*. This view of the unity of the lytic principle has been considerably debated. Obviously the determination of whether there is a multiplicity of bacteriophagic agents, each of which is more or less specific for definite microbes, is of great importance in attempts to employ the bacteriophage in the warfare against infection. At the Rockefeller Institute for Medical Research, Bronfenbrenner and Korb have lately observed persistent differences in the individual resistance of lytic filtrates active against different micro-organisms in ways that lead them to favor the conception of the multiplicity of bacteriophages. This dissipates, for the moment, at least, the hope of a single universal panacea for those infected with bacteria.—*Jour. A. M. A.*, Dec. 26, 1925.

The Need.—"You would not lead a blind man half way across a busy street and leave him there at the mercy of the traffic." This is what we do when we erect excellent sanatoria, treat the case successfully and then discharge him into the competitive world to find his place. He knows the cost of ill health and appreciates the value of being fit. He is anxious to earn a living and after all the money it has cost someone to get him well, he deserves every possible assistance from his fellow-citizens.

An Address

INVOLUTIONARY CHANGES IN PROSTATE AND FEMALE BREAST IN RELATION TO CANCER DEVELOPMENT*

By Horst Oertel

From the Pathological Institute, McGill University, Montreal

IT IS AN OLD experience that organs and tissues of the body undergo with advancing age steady regression. This proceeds unequally in different organs and tissues, but it is perhaps best recognized in both made and female sex organs, in the involutions after the menopause and of old age. It may be considered as equally well established that, paradox as it may sound, this structural and functional decline and loss is associated with proliferation of regressing cells, and this occurs in the essential (parenchymatous) parts as well as in their stroma. It is not so very long ago that such reformative and disorganizing processes in involuting organs were considered pathological and inflammatory. We know now that they are part and parcel of the physiological regression, and incident to it, and that changes which, in these instances, were formerly regarded as indicating, for example, a chronic mastitis, endometritis or prostatitis, are in reality the evidence of a physiological downward change in the living substance. In the study of these physiological regressions certain additional facts have been revealed, which demand attention as regards their bearing on tumour and cancerous development. Anyone who examines as a matter of routine such organs—as obtained in autopsy or operations—will soon be struck by the frequent appearance of curious excessive and quite abnormal cell hyperplasias in parenchymatous cells, which go far beyond simple proliferation or regenerative attempts. These occur within circumscribed areas, and affect principally those epithelial cells which line glandular ducts. These cells change their morphological and tinctorial characters, assume appearances of altered differentiation with atypical shape and size, and develop disturbed nuclear-plasma relations. Such abnormal cell types are also seen to undergo excessive hyperplasia. Thus old atrophic lining cells are gradually replaced by new cells and, what is significant, proliferate quite independently into the dilated (cystic) duct lumen, and also to the outside of the duct limitations. They are not infrequently surrounded by small cell infiltrations in the stroma. These and similar striking pictures of a restless, atypical structure are seen not only in connection with general and otherwise typical, glandular hyperplasia, but also in areas of gland reduction and collapse. They may be isolated, so that a long continued search is necessary, or they may appear in greater, multiple distribution. I, personally, have seen them quite commonly in prostate and breast, and the similarity in the regressive changes in breast and prostate is striking. Anyone unacquainted with these atypical glandular hyperplasias, would almost immediately conclude the presence of early cancer or, at least, of an adenomatous tumour, but their common, accidental appearance in organs, which are otherwise without any evidences of pathological lesions, and which would, were it not for careful routine microscopic inspection, be classed as normal for their respective age periods, makes one hesitate to regard such pictures as evidences of genuine cancers or tumour growths. Nevertheless, their formal resemblance to these abnormal hyperplasias remains, and raises the question of a possible relation to subsequent genuine tumour growth. Some investigators have, therefore, gone so far as to speak of these hyperplastic areas as "precancerous" stages. Experimental investigations into the causes and origin of tumours have shed light on these pictures. Within recent years (from 1915 on) the success-

* Presented to the Montreal Medico-Chirurgical Society at its meeting on December 18th, 1925.

ful production of surface or skin cancers has been accomplished, primarily through the ingenious work of Yamagiwa and Ichikawa, as a result of the application of tar. The latter produces, after a time, a more or less independent, atypical hyperplasia of the epidermis, which appears like a surface epithelioma. The exact place of origin is in some animals (the rabbit) in and about the hair follicles; in others (the mouse) the surface epithelium itself. Investigations into the histogenesis of these artificial tumours indicate that the active hyperplastic energy of the tar affects not only the epithelium, but also the subcutaneous connective tissue, so that, although the proliferation of the epithelium soon assumes the most obvious extension, a disorganization of the whole tissue structure occurs.

But it is highly significant that not all of these "cancerous" hyperplasias thus produced proceed to the formation of genuine cancers. Many of these artificial "epitheliomata" disappear again; it is, therefore, necessary to distinguish between those artificial growths which are truly cancerous and those, which, while formally of similar appearance, lack the genuine cancerous character. For the growths of the latter order the term "carcinoid" has been suggested by Borst, who discards the term "precancerous" for them, as misleading in so far as these "carcinoid" growths do not necessarily become cancerous. He, therefore, concludes that a second factor is necessary for the production of the cancer; that is, a specific cancerous tendency or *anlage*.

A second line of investigation, which seems to have a bearing on the anatomical findings in regressive organs, recorded above, is that of experimental tissue cultures conducted, also quite recently (1922-1925), by Maximow. The latter followed the artificial growth in vitro of mammary glands of rabbits, after excision from their original location, on a culture of bone marrow and plasma, which seems best

FIG. 1.—Typical glandular hyperplasia of prostate. High power magnification. Note the regular formation of glandular loops and of their lining epithelium. (From a regressing, but otherwise normal, not enlarged prostate of a male of fifty-five years. Specimen removed as autopsy routine).

FIG. 2.—Atypical (carcinoid) hyperplastic area from a field of the same prostate.

FIG. 3.—Same as Fig. 2. under higher power. (Contrast Fig. 1. with Figs. 2—4).

suited, in preference to other media, for these purposes. Maximow observed in these cultures, changes which closely simulated or resembled the picture of the carcinomatous process. The epithelium of the ducts becomes fundamentally altered in formal character, it undergoes atypical hypertrophy with abundant proliferation (mitoses and amitoses), and its relations to the accompanying stroma are disturbed. The latter indicates that the epithelial duct cells have really undergone a change in their biological racial position, for they exhibit infiltrative capacity into the stroma, where they form more or less typical (cancer) nests. Here also it is interesting to record that these late, genuine, cancerous stages are not always reached, but that the atypical hyperplasia may end with the "carcinoid" (precancerous) state. The epithelium of the ducts is most susceptible to these alterations; that of the secretory gland itself shows only rather insignificant changes.

In comparing these two types of epithelial growths—the natural regressive, and the experimentally induced,—one is immediately impressed by their formal similarity, so that both may be taken as carcinoid tissue changes. This similarity appears further in certain characteristic features of the histogenesis, for in both, in the regressive hyperplasias as well as in the results of tissue cultures, the epithelial duct cells are most prominently involved in the conversion to carcinoid cells.

But what is the most surprising and startling result of investigations into these regressive, hyperplastic changes in prostate and breast is the frequency with which careful, routine inspection will disclose them in one or the other location. Years ago, when we in our Institute first had attention drawn to them, we generally diagnosed them as early cancers, or at least strongly suspicious of early cancer. Since we have, however, systematically examined breasts and prostates from all sorts of cases and sources, and under all sorts of conditions, we have found such carcinoid changes so common in these organs during the regressive periods of life, that now we hesitate to report them as cancerous. If we did, the majority of these organs would show in one or another place, some stage in cancerous development. Nevertheless, I am far from denying that these atypical hyperplasias have no relation to cancer. To the contrary they are, in my opinion, potentially cancerous, "carcinoid," but they do not always develop into cancer. I can here do no better than quote once more a statement made in this connection several years ago: (1923), I said "Here is, to my mind, the crucial question of the cancer problem. The cancer cell does not alone contain and hold the secret of cancerous growth. I would go further and say that, the more I see of the regressive and progressive cell and tissue changes which are constantly proceeding in our higher organs, and which assume greater prominence with advancing age, the more I am inclined to the belief that in the majority of us potentially cancerous or other tumour cells exist sometime during our life. But—as in infections—only a number of us,—unfortunately, too great a number—enter into relations with these new cell races by offering them those accommodations which allow them to live and grow on us." For the tumour growth requires besides the presence of atypical—tumour—races of cells, one other absolutely essential factor, that is the local tissue response to their presence, which through angioplastic and stroma formation enables these cells to organize to, and maintain themselves as, tumour. Evidently tumour cells possess in these instances the capacity of a formative stimulus. Should this second factor be absent or omitted, the lesion remains at the carcinoid stage or goes completely under.

It is now over twenty years ago (1905) that I was fortunate enough to furnish a morphological demonstration of the direct transformation of degenerating multiple groups of liver cells—through what is now recognized as a carcinoid, atypical epithelial state—into the cancerous tumour, and connected *cell degeneration* or *regression* with *cancerous growth*. These assumptions, then new and much opposed on the then current theoretical conception that degeneration and growth were at opposite poles and exclusive of each other, have gradually gained ground and stand now on a well established anatomical and experimental basis. They furnish us, at least, a much better understanding than in the past of the morphological and functional position of tumour cells. But it is now evident from such anatomical and experimental observations, as recorded above, that of the second problem connected with tumour development we

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have as yet no understanding at all; that is, of the state of affairs which makes tissues locally susceptible and reactive to the presence of these cells. Out of the solution of this question will also come, if it is at all possible, artificial tumour cure. A cure of cancer will not depend, in my opinion, so much upon active destruction of tumour cells through an outside agent, but upon the artificial reproduction of a local tissue state refractory to the presence of tumour cells, and which denies the new cell race nutrition and organization. This local refractoriness which is also responsible, as we know, for immunity to tumour transplantations, (Baschford, Murray, Haarland) accounts, I believe, for those instances of "regressive growths" which remain at the point of the "carcinoid" stage; for the infiltrative capacity of tumour cells is not, in my opinion, an expression of a particular, mystic, "autonomous" energy of growth,* but a question of reciprocal relations between the tumour cells and the tissue cells of the host.

FIG. 4.—Atypical (Carcinoid) Hyperplasia from another field of same prostate.

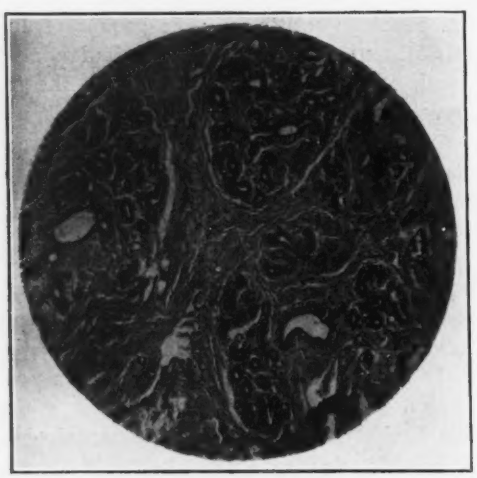

FIG. 5.—Resting stage of an involuting breast.

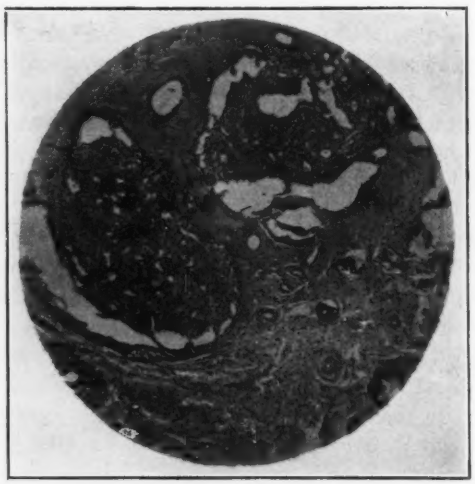

FIG. 6.—Carcinoid hyperplasia of epithelium into cystically dilated ducts from another field of the same breast.

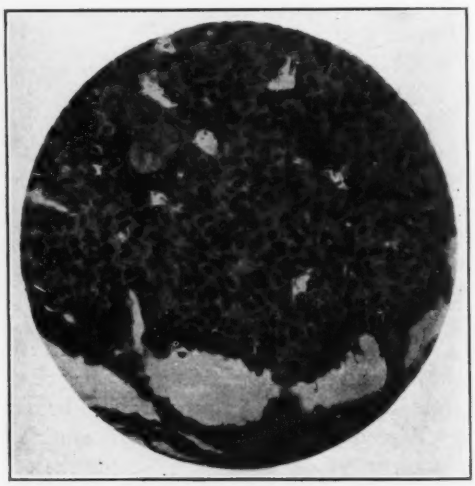

FIG. 7.—High magnification of a dilated duct filled with atypical epithelial cells, of same area as Fig. 8. Note the atypical appearance and growth of the hyperplastic duct epithelium.

* I am glad to note that this spook of mystic "autonomy" of tumour cells, as a special property or force, is also discarded by Ricker in his recent monograph: "Pathologie als Naturwissenschaft," Berlin, J. Springer, 1924.

While this article is in the printer's hands the Münchner mediz. Wochenschrift of Jan. 8, 1926, reaches me. It contains a paper by two investigators, Neller and Neubürger, "On Atypical Epithelial Proliferation and Beginning Cancer in the Senile Prostate," which is a fine confirmation of the findings recorded above; for, although dealing with a different side of this question, they found in routine examination of *approximately every fourth senile prostate,* hypertrophied or non-hypertrophied, changes of apparently the character noted above!

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HYPERTONIC SALINE IN ADYNAMIC ILEUS*

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ONE may note with some perplexity the opinions of prominent surgeons on the subject of purgation. Some have considered it essential that the bowels be moved soon after operation, while others have opposed this view. The condition of so-called "adynamic" or "paralytic" ileus is not accepted by all.

In speaking of skeletal muscle one considers paralysis present when the muscle will not react to the stimulation by which it is normally made to contract. The nerve may be injured, the muscle cell or neuro-muscular junction may be poisoned or fatigued, or the muscle may have lost its tone. In these conditions we speak of paralysis, and if the factor at fault be adjusted the muscle may again be made to contract, provided of course that it has not been allowed to degenerate.

A similar state undoubtedly exists in intestinal muscle when the gut is greatly distended. Authorities are agreed for the most part (Henderson, Trendelenberg, etc.) that the essential factor is loss of tone. If one can raise the tone, the muscle will again react to the normal stimulus, pressure, and the bowel contents will be passed onwards. The question as to the desirability of causing peristalsis in cases of peritonitis is an open one. It resolves itself into the balance between two factors—first, what harm will the absorption of the content of the quiescent bowel do to the patient? Second, will peristalsis so spread the infection that absorption from a larger area of peritoneum will be fatal? I feel that one cannot rightly recommend purgation in all cases at all times, but a view must be taken having regard to these factors. There are certainly cases in which it is essential to recovery that the bowel be evacuated, and distension be relieved.

McVicar has recently summarized the blood chemistry findings in cases of obstruction and he has outlined the indications for treatment, as first brought to our attention by Haden and Orr. There is a fall in the blood chlorides, a rise in the carbon dioxide combining power and a rise in the non-protein nitrogen of the blood. There is a definite indication for the use of salt solution in combating the chloride fall, and in minimising the harm thus caused to the organism.

For some years pituitrin and eserine have been used in post-operative ileus with varying success. The former, acting on the muscle cell will increase tone, and cause peristalsis. The latter, acting on the vagus endings, stimulates the gut to contract. Martin and Weiss, realizing the

* Received for publication January 16, 1926.

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futility of small doses, advocate the use of much larger doses of physostigmine than those we have been in the habit of using. They have not failed to obtain results in non-toxic cases when giving one twentieth to one sixteenth grain although in toxic cases the drug would appear less effectual.

We have not employed physostigmine in large doses and in most cases results with these two drugs, physostigmine and pituitrin, have been good. They have not always been effective, however, and a more certain agent was sought and found in hypertonic saline.

In July of last year Hughson and Scarff at Johns Hopkins published some experimental work on this subject. They set out to find whether or not the intravenous administration of hypertonic saline delayed absorption by the gut of fluid contained therein. This delay had been suggested by the work of Haden and Orr who had noted the alleviation of toxic symptoms in intestinal obstruction, following the administration of this salt. Hughson and Scarff felt that the symptoms in obstruction were due to deficiency in blood chlorides, but they also showed that the administration of hypertonic saline delayed absorption of toxic products by the gut.

As an *incident* in their experimental work violent peristalsis of the bowel was observed. This commenced immediately on injection and continued for about an hour. They found with more dilute solutions a latent period and less response. With distilled water and Locke's solution no effect was produced. The only factor which abolished this peristaltic response to sodium chloride was interference with the blood supply of the gut.

The work I shall describe was carried out at the University of Toronto in the department of Surgery. Before proceeding, I should say that the three clinical cases described came to my notice before this work was commenced, necessity having dictated the use of an agent, new to me, merely on the authority of the above workers.

Experimental Work.—After several attempts to make a working colostomy in which to insert a balloon, I had to give up the idea, as the dogs died. Accordingly I inserted a finger cot on a catheter in the lumen of a piece of normal bowel at the time of the laparotomy. By using a Y connection with one end leading to a mercury manometer and the other connected to a piston syringe, I was able to vary the pressure on the inside of the gut. The stylet floated on the mercury in the manometer. (Fig. 1) Using the dose recommended by Hughson and Scarff, (1/3 to 1/6 gram. per kilo), I administered 30 per cent sodium chloride solution intravenously after having raised the pressure. There was immediately an increase in tone followed by marked peristalsis. This took place even under a pressure of 95 mm. Hg. and after eserine and pituitrin had failed to produce any response with a pressure of 53 mm. Hg. The protocol of this experiment is as follows:

PROTOCOL

Experiment 5.—Dog 5: Small, black, smooth haired mongrel, male, weight fifteen pounds.

April 22, 1925: Brought out a loop of small bowel eight inches below the ligament of Treitz and inserted therein a finger cot tied on a catheter. No purse-string used to close the hole in the gut. Attached catheter to manometer (Stylet on bottom line; read up beginning at the left. Fig. 2); pressure, 46 mm. Hg.; eserine, 1/50 —no response; pressure raised to 53 mm. Hg.; pituitrin; ½ c.c. intramuscularly—no response; pituitrin; ½ c.c. intramuscularly—no response; eserine, 1/50 intramuscularly—no response; 30 per cent saline, 8 c.c. given at 3.25 p.m., tone increased and contractions began, pressure raised to 92 mm. Hg.; contractions continued; periods of rest noted; eserine 1/50 contractions began again—more sustained; same amplitude; pituitrin, ½ c.c. contractions dying down; pituitrin, ½ c.c. no change; pressure 95 mm. at point T. waves still dying down; saline, 6.6 c.c., increase in tone and active peristalsis; pressure raised by peristalsis to 116 mm.; experiment discontinued and repair made. The animal was allowed to live but died in five days, the abdominal wound having given way. Having established the fact that peristalsis can be induced in a distended gut by the intravenous administration of hypertonic saline after other known agents fail, I tried to ascertain the effect of large doses and the cause of death.

I gave to one dog (No. 9) one gram per kilo in saturated solution June 16th and it lived. It vomited and voided but did not defæcate. The bowel could be felt and heard in violent per-

istalsis. I gave to the same dog 1/2 gram per kilo on July 3rd and again on July 4th with no apparent ill effect. The animal was destroyed on July 7th and showed no gross lesions. Microscopically, no change was noted in any of the organs examined although there may have been some very slight increase in pigment deposit in the liver and spleen. I also gave 1/2 gram per kilo to a rabbit on two successive days with no apparent ill effect.

In order to test the curative effect of peristalsis so induced, I tied off the appendix and its blood supply in two dogs. They died in forty-eight hours in spite of the administration of hypertonic saline intravenously. Defæcation did not take place as it does in man and the peristalsis was ineffectual in passing on the content of the bowel.

The clinical application of this treatment is of extreme interest as shown by the following case reports. For the third report I am indebted to Dr. C. H. Gilmour, who used the method the day after having heard me report my first successful case. He has since told me of successful results in two other cases and a failure in one.

Case 1.—(Mrs. C.) Aged fifty-four, admitted St. Michael's Hospital January 17th. Two days previously she had been seized with severe pain in the lumbar region and along the right costal margin. Since then she had vomited almost continuously. There was marked distension and generalized tenderness. Temp. 101-4/5, Pulse 100, W.B.C., 10,200. The distension suggested intestinal obstruction and masked the tenderness over McBurney's point. Under anæsthesia a mass could be felt beneath the lower right rectus and I accordingly opened the abdomen over this area. I found the omentum rolled into a ball and adherent to a necrotic appendix which I removed piecemeal. At 7 p.m. the following day the abdomen was glazed and tympanitic and her condition was critical. The use of eserine, pituitrin, and enemas of every description was futile. Accordingly 75 c.c. of 20 per cent sodium chloride solution was given intravenously and two minutes later she expelled large volumes of gas and continued to do so for the next hour.

Again on the following day distension rendered her condition critical in spite of all other known agents and I again administered sodium chloride. In about two minutes cramps began, but, fearful lest they should not continue, I gave another enema and 1 c.c. pituitrin. Flatus passed for over an hour and fæces were expelled next morning with complete recovery.

Case 2.—G. A. M. Aged sixty-nine, admitted to Wellesley Hospital midnight March 10-11th under Dr. Maynard with perforated gastric ulcer. I repaired the perforation which lay posteriorly 1-1/2 inches above the pylorus and did a posterior gastro-enterostomy.

On the second day post-operative (March 12th 9.50 p.m.) he became very much distended and despite all types of enema, eserine and pituitrin, was in extremis. I explained to his son that the intravenous might save his life, while on the other hand it might hasten the end. He accepted the risk. After 60 c.c. of 30 per cent solution had been given, flatus passed immediately and for an hour continued to do so. Thereafter the flatus could be moved with enemas and pituitrin. He made a good recovery and has gained twenty-five pounds in weight.

Case 3.—W. A., aged thirty-six, admitted to Grace Hospital under Dr. C. H. Gilmour at 6 a.m. March 15, 1925, complaining of acute colicky pain in the abdomen which had commenced at 10 p.m. March 13th. On examination the abdomen was rigid, with tenderness on pressure over McBurney's point, and the leucocyte count was 23,200.

Operation was refused on the night of the 14th, but consent having finally been obtained he was operated on at 9 a.m. on the 15th. A gangrenous appendix was removed in the presence of general peritonitis and the wound was closed with drainage.

There was some distension on the 16th and again on the 17th with relief by physostigmine grs. 1/50 and strychnine grs. 1/40 every four hours. A 1.2.3. enema with 1 c.c. of pituitrin hypodermically was also effectual.

During the 18th and 19th he gradually became more distended and no relief could be obtained by the measures previously effectual. On the 20th he appeared to be dying and at 3.30 p.m. 70 c.c. of 20 per cent saline was given intravenously and another hypodermic 1 c.c. pituitrin. The needle was withdrawn from the vein and the surgeon was clearing up his instruments when the patient asked for a bed-pan. Before the nurse could obtain it the bowels moved, literally flooding the bed. He vomited no more and flatus passed continuously during the night. Recovery was uneventful, enemas and pituitrin thereafter being quite effectual.

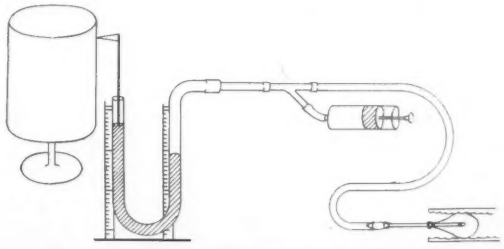

FIG. 1.—Balloon on catheter in intestine. Catheter connected to Mercury Manometer with floating stylet. Syringe for varying pressure in the gut.

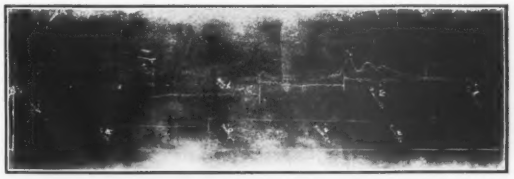

FIG. 2.—Tracing of intestinal peristalsis induced by intravenous administration of hypertonic saline.

Summary

1. Discussion of "Paralytic Ileus."

2. Toxæmia of Obstruction—the chloride factor.

3. Accidental discovery by Hughson & Scarff.

4. Experiments by the author with graphic proof of peristaltic response to this salt.

5. Comparative safety in its employment.
6. Three clinical results.

Conclusions

1. There is a condition known as paralytic or adynamic ileus which if not relieved will result in death.

2. Animal experiment and clinical proof justifies the intravenous administration of hypertonic saline in this condition.

3. Results may be expected where other known agents fail.

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STUDIES IN PERNICIOUS ANÆMIA. I. THE OUTSTANDING CLINICAL PROBLEM AND THE GEOGRAPHICAL DISTRIBUTION IN WESTERN CANADA

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INTRODUCTION

IN 1924 the College of Physicians and Surgeons of Manitoba generously donated the annual interest on the sum of $20,000.00 to the Medical Research Committee of the University, such yearly interest to be devoted to the study of some medical problem in line with, or suggested by the well known activities of the late Dr. Gordon Bell. This yearly donation was to be known as the "Gordon Bell Memorial" and the way in which it should be used was left to the discretion of the Medical Research Committee, with the general directions as outlined above.

The Medical Research Committee, comprised as follows: Doctors Gibson, Gilmour, Davidson, Stephens, Prowse, Professor Cameron, Doctors MacLeod, Montgomery, Waugh, Halpenny and Peirce—decided at its first meeting to begin on January 1, 1925, to investigate some problems in the etiology of pernicious anæmia.

Quantity of research work is a matter of dollars and cents. Quality is a matter of personnel, but without the dollars and cents little research can materialize.

Since the work the committee proposed to undertake required throughout very accurate clinical and chemical technique, the services of the most competent recent graduate in medicine, and a technician who had received specific training for the work, had to be secured. It was found that the funds available from the Gordon Bell Memorial were only sufficient to pay the stipend of the Medical Fellow, and also, since none of the interest from the grant of the College of Physicians and Surgeons became available until January, 1926, Mr. McWilliams and a number of his associates of the Winnipeg Grain Exchange came to our assistance with a gift of $2,000, and this, with some funds available from the former Diabetic Research Committee of the University, has sufficed for the payment of the personnel and laboratory upkeep during the present year. The gentlemen taking part in this donation were Messrs. W. H. McWilliams, J. A. Richardson, Sidney Smith, W. A. Murphy, J. C. Gage, Harold D. Gooderham, E. E. Hall and C. G. Spencer.

It is a well remembered fact that Dr. Gordon Bell had far more than a general interest in the problem of pernicious anæmia. Over twenty-five years ago, associated with the late Dr. Frederick Torrance, Dominion Veterinarian, he had spent two summers in the investigation of the blood condition and clinical symptoms of swamp fever in horses. The blood picture in swamp fever has

a very remarkable resemblance to that characteristic of pernicious anæmia in the human subject, and from that time forward the etiology of pernicious anæmia became a subject of paramount interest to him. Within the month preceding his untimely death Dr. Bell had resigned his position as provincial bacteriologist to become professor of bacteriology in the University, and he confided to a number of his intimate friends that his new appointment would afford both time and opportunity that he might pursue the line of original investigation which he had so long desired to follow. But the race is not to the swift nor the battle to the strong, and the torch he held so high is ours to hold aloft as best we may. It is, therefore, the feeling of the committee that the study of pernicious anæmia offered abundant opportunity for original work and, at the same time, carried with it an inspiration owing to Dr. Bell's long-continued efforts in the same direction.

Having, therefore, decided upon an intensive study of the etiology of pernicious anæmia, and having funds available to defray expenses for a period of a year, in January, 1925, Dr. M. Rioch with Miss Foster as technician began work in the old laboratory for diabetes research in the Medical College. A review of the literature going back for a five year period seemed to be essentially the best method of approach, and Dr. Rioch spent a good deal of time during the first three months in summarizing a long list of instructive and authoritative articles dealing with such diseases of the blood as were distinctly pertinent to the subject at hand. At the same time a study of blood chemistry, with particular reference to blood chlorides, was undertaken and the results obtained are published in the second article of this series.

The study of blood chlorides was suggested chiefly by the fact that the one outstanding, unchanging and never-failing pathological condition in pernicious anæmia is the absence of hydrochloric acid in the gastric secretion.

Abundant clinical material was obtained in the medical wards of the Winnipeg General Hospital, and from patients sent directly to the laboratory by the medical men of Winnipeg and the adjacent rural communities.

The following paragraphs are intended to express, not a summary of the year's work in clinical investigation, but some outstanding facts which have impressed the writer as worthy of fuller investigation, and as indicating the probable direction from which results of some importance may be confidently expected.

In the ninth edition of Osler's *Principles and Practice of Medicine* (1920) that great clinician says of pernicious anæmia, "the cause remains obscure, the nature and origin of hæmolysins are unknown, we have not got much beyond the position of Addison who characterized the disease which he was describing as 'a general anæmia without any discoverable cause whatever'; cases in which there has been no previous loss of blood, no existing diarrhœa, no chlorosis, no renal, splenic, miasmatic, glandular, strumous, or malignant disease." Since Addison recognized and described pernicious anæmia seventy-six years ago a mountain of facts has accumulated in regard to the manifestations of the disease. Its diagnosis is comparatively easy even without laboratory assistance; the lemon-tinted skin, the increasing pallor without loss of flesh, the tendency to morning diarrhœa, flatulence with loss of appetite, the highly coloured urine, often a tingling and numbness of the fingers and toes, are such well-known and evident indications of the nature of the malady that he who runs may read.

The general practitioner unfortunately has many opportunities of following such cases to a fatal termination. The disease is very prevalent. During the five year period, 1919–1924, in my province a population of 600,000 had 248 deaths ascribed to pernicious anæmia. A study of the geographical distribution of the disease in the Canadian Northwest has led to some curious and interesting results. The method followed in this geographical survey was briefly by circularizing all medical men in the three Provinces of Manitoba, Saskatchewan and Alberta, asking for a statement of the number of casess een, age, and sex of each case, and any notable instances of grouping of cases according to family, locality, or race. The circular was made purposely brief so that a complete answer did not involve much effort on the part of the physician who replied. In reply to some 1,200 circulars mailed, 350 answers were received; then a map of each province was prepared showing townships as units, with the number of cases which were reported indicated on each township. A glance at such a map shows that certain localities furnish a very large percentage of cases, while many townships of the same, or even greater population, reported only occasional cases. A good deal of time was spent either in correspondence with, or by personally interviewing, practitioners in these areas of segre-

gation to verify or correct, or to supplement the information already at hand. One such area of segregation within 100 miles of Winnipeg was visited by the writer in company with two other medical men and Professor Cameron of the Department of Biochemistry of Manitoba University.

By means of this questionnaire and personal interviews in a limited area, the writer was able to get information regarding 320 cases which had been reported within a five year period. Of these sixty per cent. were males, showing no marked differences between the sexes as to incidence.

As to average age: in Manitoba it was fifty-four years, in Saskatchewan forty-eight, in Alberta forty-seven and in British Columbia fifty-seven. The average age of all cases reported was fifty-one years. The age of the youngest case reported was twenty years; the oldest eighty. Fifty-three per cent of the replies received reported no cases.

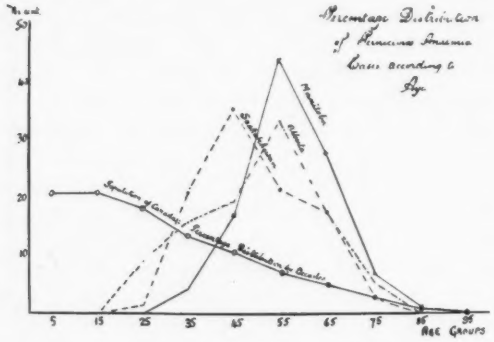

FIG. 1.

The geographical distribution of reported cases is the most interesting product of this survey. As examples of the marked variation in frequency in different localities a territory containing thirty-six townships, a population of 20,000 and the four towns of Carman, Morden, Miami and Manitou, reported eighteen cases, or ninety per 100,000. A territory equal in size, immediately east of that just quoted, with 22,000 inhabitants reports twenty-three per 100,000. Another block of thirty-six townships immediately adjacent to Winnipeg with 12,000 inhabitants reported that not a single case of pernicious anæmia has occurred within five years. Further to the northwest, a similar block with 11,500 of a population gave an incidence of eighty-eight per 100,000.

While the total number of cases reported is relatively small and the period of time involved short, still such factors as those just quoted in regard to geographical distribution demand an explanation; it is unnecessary to follow step by step our speculation in regard to the environmental factors or our itinerary through one such segregated area, *viz.*, the Carman, Morden, Manitou district. It is sufficient to state that if there was any single feature of environment which was common to every habitation and which was evidently worthy of investigation, it was the water supply.

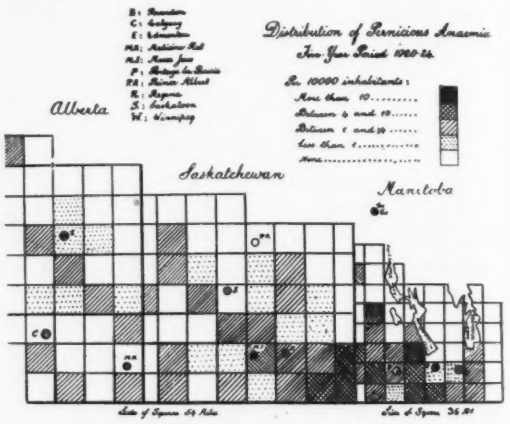

FIG. 2.

NOTES RE MAP

Manitoba has been divided into squares of thirty-six miles base (at the International Boundary). The population of the squares (excluding cities) in the southern half varies from 9,000 to 22,000.

Saskatchewan and (most of) Alberta have been divided into squares of fifty-four miles base, and excluding the cities, the population of most of these squares (excluding the fringes) varies from 7,000 to 28,000. Figures for such places as The Pas are illusory. There, two cases are reported for a population of 1,500. One of these two came from Manitou, in a high percentage area.

Results for cities generally tend to be deceptive, since so many older people migrate late in life from country to city. It is therefore probable that the native-born city dweller, or one who has spent most of his life in a city is more immune than the map indicates. Portage la Prairie however, has a definitely high rate, (at least eight cases in a population of 7,000). Brandon probably reflects the high rates of districts to east and west of it. Moose Jaw shows the same high rate as the district surrounding it.

Professor Wallace agrees that the high rate areas in central and southern Manitoba cor-

respond to the south-western lip of the old glacial Lake Agassiz, where highly alkaline saline waters are to be expected, and that the absence of the disease in the corresponding lip of the Lake in eastern Manitoba may be due to the fact that the surface waters form the drinking water source. He points out that the corresponding high percentage district in the extreme west of Manitoba and south-east of Saskatchewan corresponds to the Saskatchewan glacial Lake Souris, with similar potentially bad drinking waters. On the other hand the Moose Jaw area consists of undrained glacial moraines, and their effect on the drinking water is less certain. The relations of water supply to the incidence of the disease in the Portage la Prairie area also requires further investigation.

In considering our analytical results (subjoined) for various drinking waters, it must be remembered that if there is any effect from long continued drinking of "bad" water, this may not be manifested for many years. If the first result be gastric anacidity, to be followed, perhaps much later, by pernicious anæmia, then we are not so much conerned with what has been drunk in the last ten years, as what was drunk in the twenty years previous to that period. In the interval, in many places, especially in the cities, better drinking water has been installed.

Such results as those for Holland and for Morden, where the water is definitely bad, and has always been so, and where the cases reported are known to have been resident in the district for very long periods, are therefore justifiably to be emphasized.

The following analyses were carried out chiefly by micro-methods on small amounts of water, and are therefore approximate but comparable. For comparison, some figures of London drinking water have been calculated from Thresh's (standard) results.

All the following samples (except those quoted from Thresh) were collected between August 24 and September 4, 1925.

Comment on Fig. 3 below.—The first six waters examined are not so much truly alkaline as highly saline, with high sulphate, chloride, carbonate, calcium, and magnesium contents. Those which can most truly be related to pernicious anæmia patients who must have used them for many years (Morden and Holland) are the worst waters examined. The Carman and Manitou waters are intermediate, and the others distinctly approximate to a normal water supply. The analyses for Carberry and Neepawa probably have no bearing on the incidence of the disease, since the course of supply has been changed relatively recently.

No conclusion can safely be drawn as to any effect due to excess of a particular constituent, but the results are in agreement with the possibility that a highly saline water supply may be a factor in the etiology of pernicious anæmia.

Race incidence must be considered in this connection. The victims were almost without exception Anglo-Saxons and Scandinavian, and usually blonds; among reported cases there were only two Germans and one Pole. The area visited contains a large German population and to the south of Holland considerable settlements of French and Belgians. In all this territory there was not a case reported of other than Anglo-Saxon or Scandinavian origin. An explanation of this (not necessarily the correct one) is to be found in the fact that the part of Manitoba indicated was originally peopled about forty years ago by settlers from the Eastern provinces and the British Isles; the Germans came later, and the French and Belgians later still. Is it

Place	*No. of Cases reported from Town or Village permanent residents.*	*Population of Town or Village*	*pH as Measure of Alkalinity*	*Constituents Estimated in parts per 100,000*				
				Sulphate as SO_4	*Chloride as NaCl*	*Carbonates as CO_3*	*Ca.*	*Mg.*
Morden.....	4	1,200	7.3	47	33	84	25.5	4.1
Carman....	3	1,400	7.5	43	38	78	17.4	4.7
Manitou....	1	500	7.0	17	35	66	19.3	3.9
Holland....	6	400	7.5	48	110	75	57.3	3.6
Ninette.....	0	400	7.1	48	25	75	16.5	3.8
Gladstone...	0	800	7.7	30	10		14.	3.5
Carberry....	4	760	8.4	17	78		15.2	3.3
Neepawa....	4	1,900	8.2	15	−1		10.2	2.7
Winnipeg...	?		7.8	0	−1	48	11.6	1.1
Deep wells from one London Water Company -- (Chalk under lower London Tertiaries) Values are mostly near lower limits.				6–55	23–58	12–20	0.5	0.1–2

FIG. 3.

likely that within the next decade communities not of Anglo-Saxon or Scandinavian origin will contribute their quota of victims?

Family tendency: Of 320 cases reported, in nine instances more than one case had occurred in the same household; at Carman four in one family; at Portage la Prairie two brothers in one family, and a brother and sister in another household; at McAuley two in one family; at Cereal three in one house; at Qu'Appelle four; at Whitewood three, and at Rosetown, Sask., two.

The most notable instance of segregation of cases in a limited area but in different houses is found in the village of Holland, a small hamlet with a population of 400, where six cases have occurred within five years. Curious features of this group are that all these patients are women and all between fifty and sixty years of age. From the analysis of various water presented it may be seen at once that the water supply of this village is notably high in alkalinity and saline constituents.

The uniform absence of free HCl in the gastric contents is to the writer's mind the most characteristic feature of pernicious anæmia. The blood picture varies tremendously, at one time it may be typical and diagnostic, and at another time it may be quite normal. There is commonly leukopenia, but occasionally the leucocytes are normal in number and also in type. There may be no manifestations of involvement of the nervous system, and so on through the whole category of symptoms and physical findings; but achlorhydria is always present. What is the relation which this defect in the gastric secretion bears to pernicious anæmia? Does it cause the disease? Is it a consequence? As the presence of achylia gastrica in Addison's anæmia has been recognized for a very long time an immense amount of literature has accumulated anent its significance. Up to the present the controversy has been fruitful only in theory.

Dr. T. Izod Bennett, assistant physician of the Middlesex Hospital, in discussing achylia gastrica says: "In young healthy adults achylia gastrica is about as common as red hair and we have no convincing evidence that it has any pathological significance."

It is necessary in this connection to differentiate clearly between the achylia gastrica resulting from chronic gastritis (let us say of alcoholic origin) and the achylia gastrica which is purely functional and which is found to be invariably present in pernicious anæmia.

From available post mortem records it would seem that the lack of an acid gastric secretion in the majority of cases is a purely functional defect, the minute structure of the gastric mucous membrane showing no pathological changes; on the other hand with the achylia gastrica resulting from destruction of the secretory apparatus, *e.g.*, in the gastritis of chronic alcoholism, there does not appear to be any increased liability to Addison's anæmia.

There can be little doubt that achylia gastrica is a factor of first importance in the etiology of pernicious anæmia, but the presence of achlorhydria does not imply that the individual in whom achlorhydria exists has pernicious anæmia. There are other units which must be present before the equation is complete.

No field of clinical research offers a more fertile soil or promises a more abundant harvest than does the full investigation of achylia gastrica. Having this end in view, about a year ago it was determined to do a fractional gastric analysis on all available patients who came to the Winnipeg General Hospital. From a consideration of the results obtained one would be inclined to disagree with the statement that there is no convincing evidence that achylia gastrica has any pathological significance. On the contrary achylia gastrica seems to be present in a large percentage of cases of serious organic disease, while in a group of healthy young adults—students and nurses—there was not a single case of achlorhydria.

Taking this hundred patients who entered the Winnipeg General Hospital within a year and excluding cases of peptic ulcer, chronic appendicitis, gall bladder disease and other diseases of the gastro-intestinal tract, the average amount of free HCl was found to be 6, while taking a somewhat smaller group of students and nurses all in good health, the average amount of free HCl was 15.

There was complete achylia gastrica in all cases of pernicious anæmia; in nine cases of gastric carcinoma free HCl was present in one case only; seven cases of diarrhœa of unknown origin had all achlorhydria. In six cases of secondary anæmia of unknown etiology there were four examples of achylia gastrica, while in all cases of secondary anæmia of known origin (secondary to hæmorrhage) hydrochloric acid was present in about normal amounts.

In all cases of thyroid disease examined, *viz.*, examples of exophthalmic goitre, toxic adenoma and myxœdema, there was no free HCl present

in the gastric contents. From the relatively small amount of material reviewed the following conclusions appear to be warranted: achylia gastrica may be considered as a pathological condition. Achlorhydria is a characteristic finding in most forms of anæmia and is always present in Addison's anæmia; a deficiency or absence of gastric acid is a fairly constant finding in most chronic constitutional diseases.

What is the connection between achylia gastrica and pernicious anæmia? At present it would appear that the solution can only come through painstaking and prolonged clinical research, research of the type which enabled Sir James MacKenzie to understand and intelligently treat the irregular heart. Many cases of achylia gastrica must be followed for years, for decades, in order that we may be able to evaluate the real significance of achlorhydria.

Research in human biological problems involves concentrated effort carried on with unbroken continuity maybe for several generations of investigators; who among the present generation, which lives in an atmosphere of hurry and is always looking for immediate results, is willing to begin something which his grandson may complete? If there are such individuals in our ranks they will certainly gain posthumous fame and achieve something worth while in medical science. As an illustration of what might be carried out by all general practitioners I will present a typical case history.

Mrs. O. S., aged twenty-one, Anglo-Saxon, tall, slim, fair type, first came to me in 1900. She had been brought up on a farm and accustomed to outdoor life and the usual dietetic and hygiene conditions of the community. She complained of certain dyspeptic symptoms. The examination of stomach contents after a test meal demonstrated the condition achylia gastrica. At that time the patient had a good color, and apart from her dyspeptic complaints was apparently in normal health. About five years later she became pale and numerous blood counts made during the succeeding ten years showed the characteristic findings of a secondary anæmia. During all this time achylia gastrica was present. In 1922, after a large uterine hæmorrhage amenorrhœa persisted and she was believed to have reached the menopause at the age of forty-three. Several months later (July 1922) she was admitted to the Winnipeg General Hospital where a blood-count revealed the following: red cells, 720,000; immature cells of all types present; color index, 1.4; white cells, 2,900; no HCl present in gastric contents after a test meal. After a transfusion she improved rapidly, but in December, 1923, she got a cold, rapidly lost weight and became breathless from palpitation. Her skin was lemon-tinted, she suffered from numbness and tingling in hands and feet, her tongue became sore and she also had diarrhœa.

She was admitted again to the Winnipeg General Hospital in March, 1924, almost moribund. Her red cells were under seven hundred thousand, color index 3.5. She died the following day.

The *autopsy* findings showed fluid in all serous (?) sacs, an enlarged spleen, dilatation of large and small bowel and complete (congenital) absence of the appendix.

It is evident therefore that this woman had achylia gastrica for twenty-four years, that she had an anæmia for almost twenty years, and that for at least two years before her death her condition was typically that of Addison's anæmia.

On the other hand I might present case histories of numerous individuals who have had achylia gastrica for five, ten or even twenty years and who are yet in vigorous health. Such patients are well worth watching. Quite recently I was greatly surprised to find a normal gastric content in a woman aged fifty who for ten years previously had shown achlorhydria, and who had for the same time a definite reduction in hæmoglobin.

Nervous Manifestations

In a certain group of cases of pernicious anæmia the nerve symptoms are the first to appear; this is particularly true of older individuals. In such cases there are as a rule no remissions. A feeling of numbness or tingling in the fingers or toes or down the outside of the thighs are among the earliest signs of the cord lesion; one must be careful not to confuse this secondary combined sclerosis with a multiple neuritis which may arise from the administration of arsenic.

A secondary combined sclerosis may also arise in the course of toxic processes due to ergot, lead and pellagra, or in cancer, tuberculosis, diabetes or many subacute infections. In other words, the pathological condition of the spinal cord in pernicious anæmia appears to be rather good evidence of the presence of a chronic infectious process. Are such cord symptoms usually found in patients who have evident or cryptic focal infections? This is but one of a vast number of queries that have occurred to me during the preparation of this paper.

Osler says: "It is a curious thing that a severe anæmia (pernicious anæmia) may follow, not precede, the signs of cord disease." May we say the same of achylia gastrica and of glossitis?

Owing to the spectacular character of the patient's appearance, the pallor, the breathlessness, etc., we are prone to concentrate our thoughts and our methods of investigation on anæmia, and to found our theories of causation on the hæmatological evidence, forgetting, or at least neglecting, properly to evaluate other very important though less evident features of the disease.

XUM

There are four diseases, the clinical and laboratory findings in which closely resemble those of pernicious anæmia, and it is a singular and significant fact that in all of these diseases the pathological process is to be found in the intestinal tract. These four are: hookworm disease, the fish tapeworm disease (bothriocephalus latus) sprue, and probably pernicious anæmia of horses, which is sometimes called "swamp fever."

In the case of the hookworm disease it is believed that the toxic effect on the blood or the hæmolytic process, if you wish, is caused by a substance secreted by certain glands in the body or in the head of the worm. A very similar origin is given for the toxic agent in the case of the fish tape worm disease. In sprue the active agent is the *monilia psilosis*, a minute organism related to the yeasts; and in the pernicious anæmia of horses the organism would seem to be the larvæ of the gastrophilus equi, or common bot fly. It is thus evident that the toxic substance can be produced by a nematode, by a tapeworm, by a yeast and finally by a highly organized insect. What the common factor is in all these different toxic substances has not been determined, but in each case a condition is produced which is, clinically, quite similar to pernicious anæmia. One would, therefore, be justified in concluding that the toxic process goes on in the intestinal tract of man in cases of pernicious anæmia; but there must be a predisposing cause in all of these conditions; let it be lowered resistance, trauma, or heredity, or whatever you say. Are we not therefore justified in assuming that the predisposing cause of pernicious anæmia is, in all probability, associated with the condition known as achylia gastrica, and in the series of cases which I am able to present it may also be fairly assumed that the continued use of "bad" drinking water has had something to do with lowering the acid content of the gastric juice, or at least that the large incidence of this disease is in some way definitely associated with the use of a water of the type which I have described, that is to say, of water slightly alkaline and containing an excess of calcium, magnesium, chlorides and sulphates?

Health in Relation to Citizenship in Urban and in Rural Communities.—John A. Ferrell, New York summarizes his paper as follows: Public health is one of the major community interests. Community funds wisely used for health service yield large returns. The scope of the health service will vary with problems, resources and the public conscience, but in all cases should include basic activities. In the interest of economy and efficiency, the political unit should be large enough to permit the employment of a well rounded unit of trained full-time personnel. The cost of the service should be assumed jointly by the state, county and towns on an equitable basis. The rural community is economically handicapped, so that unaided it cannot finance health and other services approaching in adequacy that of urban communities. It is being abandoned to an alarming degree. The urban community cannot enjoy its present prosperity and civic advantages indefinitely unless its outlying country which furnishes foods, raw materials and markets is afforded similar advantages. The urban and rural communities have a common interest in the equalization of taxation and also of facilities for health and for educational, social and economic welfare. This should be accomplished through the larger political unit, such as the state. Experience in this direction has been encouraging. The plan should be extended.—*Jour. Am. Med. Ass.*, Aug. 15, 1925.

Urinary Calculi.—The chemical composition and structure of urinary calculi in relation to radiography is discussed by Daniel E. Shea, Hartford, Conn. He says that the relative opacity of a urinary calculus depends on the total molecular or atomic weights of its constituents and is influenced by its structure and thickness. Some urinary calculi having constituents of low atomic weights are negative to the rœntgen ray. These include stones composed of uric acid, urates and triple phosphate. The diagnosis of urinary calculi should not be guided entirely by radiographic reports. Cystoscopy and urography are very necessary as well as valuable adjuncts in the diagnosis of urinary calculi.—*Jour. Am. Med. Assn.*, Dec. 19, 1925.

STUDIES IN PERNICIOUS ANÆMIA. II. CHLORIDE METABOLISM IN THE ANÆMIAS, ESPECIALLY PERNICIOUS ANÆMIA*†

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UP to the present time chemical studies of pernicious anæmia have been disappointing, inasmuch as in some phases the results are too few and require confirmation, and in more they are so conflicting that no definite conclusions can be drawn from them.

In attempting to contribute to the biochemistry of this disease it has seemed to us desirable to attack single phases of the problem in turn, and by the adoption of the most rigorously accurate technique available to endeavour to draw decisive and unquestionable conclusions.

Since the outstanding chemical feature of the disease is the almost invariable absence of free hydrochloric acid from the gastric secretion, we have selected the chloride metabolism for our initial study. An investigation seems desirable in regard to the absence or presence (and extent) of the variations from normal of the following factors of this metabolism:

1. Chloride depletion or chloride retention.
2. The extent to which gastric achlorhydria is an accompaniment of the disease, and the presence or absence of the chloride ion in the gastric secretion.
3. The normal or abnormal distribution of chlorides in the blood, and perhaps
4. The normal or abnormal distribution of chlorides in the tissues.

1. Chloride depletion or retention in pernicious anæmia.—Since accurate experiments to decide whether there be any depletion or retention of chlorides require the facilities of absolutely controlled diets in metabolism wards, and as such facilities were not available to us, we have carried out no experiments to ascertain whether there are deviations from normal. The few statements that are available in the literature appear to indicate that there may be some degree of chloride retention.

Some early observations by von Stejskal, by Moraczewski, and by Strauss, have been summarized by Strauss[24] in Von Noorden's handbook. They appear to have been fairly accurately controlled. Strauss concluded that retentions of chloride to a vary extent (the figures show an average amounting to about a gram of sodium chloride per day) are not at all infrequent. These series of observation were each of only a few days' duration. A continuous chloride retention of this order over a long period seems extremely unlikely. A temporary retention is presumably to be accounted for by the œdema that frequently accompanies the active phase of the disease.

Of recent work Höst[1] (1920) considers that there is chloride retention, due to the hydræmic condition of the blood, and Major[2] (1924) reports a series of three cases which showed low excretion of chlorides, and to which administration of sodium chloride did not increase chloride excretion.

2. The extent to which gastric achlorhydria is an accompaniment of pernicious anæmia, and the presence or absence of the chloride ion in the gastric secretion.—The existence of gastric achlorhydria with pernicious anæmia was first described by Fenwick[3] (1870), who also observed the absence of pepsinogen in the gastric mucosa.

* The expenses of this research, as indicated in the first paper of the series, were largely defrayed by a donation from Mr. W. H. McWilliams and a number of his colleagues on the Winnipeg Grain Exchange, to all of whom our thanks are due.

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Received for publication January 22, 1926.

XUM

Minot,[4] in the *Oxford System of Medicine* (1920) states that "absence or at least very marked diminution of the hydrochloric acid (achlorhydria) of the stomach is found in practically every case (of pernicious anæmia)... Achylia or achlorhydria is a feature of the disease and remains present whether gastro-intestinal symptoms are severe, mild, or absent, or whether the individual is in a state of remission or relapse. Achylia may be the first symptom of the disease and be present for some years before definite anæmia or any clear cut blood changes are observed." Cabot[5] (1908) in *Osler's Modern Medicine* states "Chemical examination of the stomach shows,.... that hydrochloric acid is usually absent or greatly diminished, while the digestive ferments, less often tested for, have also been found as a rule to be absent. Among the records of seventy-nine cases seen by the writer in which the gastric juice was tested, only in one of this number was hydrochloric acid found in any considerable quantity."

Considering the recent literature, in 1923, Dr. Charles Hunter[23] reported twenty-five cases in Manitoba, all of whom showed complete gastric achlorhydria. Faber and Gram[6] (1924) reported four cases in which the achlorhydria preceded the definite onset of pernicious anæmia by from three to twelve years, but on the other hand also reported four cases in which free acid was present almost to the normal extent.

Hurst[7] (1925) reports complete achlorhydria in all of a series of thirty-six cases, and, from a summary of the literature, has shown that of 615 cases reported by seven different observers only ten (1.6 per cent) did not show complete achlorhydria, and the results in five of these ten cases were regarded as doubtful. The remaining five cases (Faber's) form such a minute percentage of the total (0.8) that one almost feels justified in questioning either the accuracy of his technique or (more probably) the accuracy of the diagnosis, especially since three of the four (hæmolytic) cases reported by Faber and Gram do not appear to have exhibited any remission so characteristic of the disease, but to have proceeded steadily to a fatal ending.

Sturtevant[8] (1925) has just published a report of a case in which the achlorhydria preceded the pernicious anæmia by fourteen years.

Dr. E. W. Montgomery (see the first paper of this series) has seen no case of pernicious anæmia with gastric hydrochloric acid during many years' experience with a large number of cases, and quotes a definite case of pernicious anæmia which developed after twenty-five years of known achlorhydria.

We have carried out fractional gastric analyses on sixteen cases of pernicious anæmia in the active stage and ten in remission. The Rehfuss fractional method and the Ewald test meal were employed (as outlined in Hawk[25]) with the exception that dimethylaminoazobenzene was used as indicator for the free acid. Similar examinations were made with ten cases of secondary (either hæmolytic or hæmorrhagic) anæmias of known origin, six giving the symptom complex called by Dr. Montgomery "chronic chlorosis", and five others of unknown origin. Since most of these cases were hypo- or achlorhydric, with rapid emptying of the stomach, the test could not usually be continued beyond the 1.5 hour period. The results are shown in Table I., which includes also a number of cases in which free hydrochloric acid had been previously reported, but which were not anæmias. See Table I.

Our results lend still further support to the invariability of gastric achlorhydria in pernicious anæmia, and its persistence in the stage of remission. In a certain number of cases of secondary anæmia and in some cases sent to us

TABLE I

GASTRIC ANALYSES

Condition	*No. of cases*	*Free HCl present*	*Free HCl absent*	*Complete Anacidity*	*Remarks*
Pernicious anæmia, active phase	16	0	16	3	
Pernicious anæmia, remissive phase	10	0	10	4	
Various secondary anæmias	10	3	7	0	Incl. 2 with cancer of stomach
"Chronic chlorosis"	6	3	3	1	
Secondary anæmias of unknown origin	5	1	4	0	
Reported achlorhydrias without anæmia	12	8	4	1	Incl. 2 with cancer of stomach

with reported gastric anacidity we have found free hydrochloric acid present. We have observed, in conjunction with Dr. Daniel Nicholson, Assistant Professor of Pathology in this University, and in agreement with previous investigators, that in various conditions there may occur marked fluctuations of gastric hydrochloric acid, even to its complete disappearance. No case of pernicious anæmia, however, has come under our observation in which gastric analyses repeated over a period of time by the same or by different observers have revealed the presence of free hydrochloric acid.

Gastric secretion contains approximately 0.5 gm. of chloride-chlorine per 100 c.c., which is in great part accounted for by the gastric hydrochloric acid. There are scarcely any published data, so far as we can discover, on the presence or absence of the chloride ion in the gastric secretion in conditions accompanied by gastric achlorhydria, such as pernicious anæmia. Bolton and Goodhart[9] (1922) emphasize regurgitation as a factor diminishing free hydrochloric acid, and occasionally masking it, but Bolton[10] (1923), speaking of pernicious anæmia states that "The secretion in this disease is practically absent, and it is not a question of neutralization."

We have endeavoured to ascertain in a number of achlorhydric cases whether the chloride ion might still be present in absence of free acid. The chloride content of the test meal was determined by the Volhard procedure, as were also those of the various gastric fractions. As previously stated, on account of the rapid emptying of the stomach but few fractions could be obtained. The results are shown in Table II and are expressed in terms of chlorine, the HCl-Cl being calculated from the free-HCl figures. For comparison, two cases without achlorhydria, and without anæmia, are included. The residual content values are not included. See Table II.

The results for the two cases of chronic chlorosis show in the one case a slight initial dilution and practically no values above that of the food mixture, while in the other the dilution is more prolonged. In neither case does it appear that chloride has been added to the food mixture (which seems to exclude regurgitation) though the dilution suggests the possibility of addition of a gastric juice devoid of chloride. Three of the four cases of pernicious anæmia show very similar results. The fourth shows a definite increase after three-quarters of an hour, perhaps due to regurgitation, though in this case the possibility of a delayed gastric secretion containing some chloride is not excluded.

These results are in marked contrast to the two final cases, in which free hydrochloric acid was present, and in which total chloride is the sum of that of the test meal, the free acid, protein hydrochloride, chloride from neutralization by regurgitation (if this occurred), and chloride from gastric secretion other than the acid. Emptying was slower and these two series were not completed.

It would be difficult to devise a method which would absolutely exclude regurgitation, but it seems at least legitimate to conclude that at any rate in the majority of cases of pernicious anæmia gastric secretion is either absent, or if present does not contain the chloride ion.

In connection with the examination of the gastric contents some results that we have ob-

TABLE II

CHLORIDE-CHLORINE CONTENT OF GASTRIC FRACTIONS

Condition	*Test meal Cl %*	*0.25 hour gastric fractions* 1		2		3		4		5	
		HCl-Cl%	*Total Cl%*	*HCl-Cl%*	*Total Cl%*	*HCl-Cl%*	*Total Cl%*	*HCl-Cl%*	*Total Cl%*	*HCl-Cl%*	*Total Cl%*
Pernicious Anæmia, active..	0.16	0.00	0.15	0.00	0.10	0.00	0.10	——	——	——	——
Pernicious Anæmia, active..	0.16	0.00	0.08	0.00	0.11	0.00	0.28	0.00	0.29	——	——
Pernicious Anæmia, active..	0.16	0.00	0.16	0.00	0.08	0.00	——	0.00	0.20	——	——
Pernicious Anæmia, remission	0.16	0.00	0.17	0.00	0.15	0.00	0.14	——	——	——	——
Chronic Chlorosis.....	0.16	0.00	0.11	0.00	0.11	0.00	0.10	0.00	0.13	0.00	0.10
Chronic Chlorosis.....	0.16	0.00	0.08	0.00	0.12	0.00	0.13	0.00	0.18	0.00	0.16
Urinary calculus.....	0.16	0.04	0.28	0.06	0.32	0.06	0.37	0.07	0.40	——	——
No. apprec. disease.....	0.16	Pres.	0.28	0.05	0.31	0.07	0.40	0.11	0.40	0.11	0.40

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tained in testing for peptic activity (or, more exactly, presence of pepsinogen) may be mentioned, especially since they emphasize the fact that in a proportion of the cases of pernicious anæmia true achylia does not exist. Mett's tubes were placed in the mixed gastric fractions, hydrochloric acid added to 0.2 per cent, and the mixtures kept at 37°C. for eighteen hours. The results are given in Table III.

TABLE III

PEPTIC ACTIVITY IN PERNICIOUS ANÆMIA

Case	*Condition*	*Egg-white digested*
		mm.
1.	Pernicious anæmia, active	0.4
	" " " , after 4 weeks HCl therapy	0.75
	" " " , after 8 weeks HCl therapy	0.0
2.	Pernicious anæmia, active	1.8
	" " " , after 4 weeks HCl therapy	0.0
3.	Pernicious anæmia, active	0.0
	" " " , after 4 weeks HCl therapy	0.0
4.	Pernicious anæmia, active	0.0
5.	Pernicious anæmia, active	0.5
6.	Pernicious anæmia, remissive	0.0

Under normal conditions at least 2.5 mm. should be digested. The results show that in one of the cases examined peptic activity was almost normal, in two there was a trace of activity, and in three none, while after hydrochloric acid therapy there was a decreased, rather than an increased activity. (The hydrochloric acid dosage followed was greater than usual, being that recommended by Hurst[11] (1924) as necessary to produce a complete bactericidal effect. After its use the gastric contents were invariably more mucoid, but the clinical results obtained with this dosage were good.)

3. The normal or abnormal distribution of chlorides in the blood.—Boenheim[12] (1921) and Myers[13] (1921) found that in pernicious anæmia whole blood chloride is increased. The published figures of Gram and Norgaard[14] (1923) appear to indicate that cell chloride is lowered in this disease, though Gram[15] (1924), using defibrinated blood, reported that the cell chloride is normal, or even increased. Buckman and Edwards[16] (1923) stated that their results were not in accord with those of Norgaard and Gram, and that they found no depression of the chloride content of the corpuscles peculiar to pernicious anæmia. Their procedure was not stated. Haden[17] (1925) states that there is no constant variation in blood chlorides which can be regarded as typical of the anæmias. No definite conclusions can be drawn from these varied statements. Apparently in none of the investigations was the cell-chloride content directly measured.

It is to be expected that since cells normally contain approximately 0.3 per cent chloride (expressed as NaCl), and plasma 0.6 per cent, whole blood with 40 per cent corpuscles consequently averaging 0.48 per cent, when there is a marked decrease in cell content the whole blood figure will tend to approximate to the higher (0.6 per cent) level of the plasma. This relationship emphasizes the necessity of obtaining separate data for plasma and corpuscles in any disease in which the ratio of corpuscles to plasma is distinctly affected. It is well shown in Table IV., drawn from our own results with a technique described later. All the figures are expressed for NaCl, and Van Slyke's method of analysis was employed for all. The calculated figures for whole blood are the sum of the plasma chloride multiplied by the plasma volume, plus the cell chloride multiplied by the cell volume. See Table IV.

Of forty-one cases for which data were determined, in which the cell volume varied from 48 to 9.5 per cent, and the whole blood, estimated directly, contained chloride from 0.43 to 0.61 per cent, the figures for whole blood chloride calculated from the plasma and cell values and volumes did not differ from those actually found by more than 0.02 per cent in thirty-four cases. The table shows definitely that the lower the cell volume, the higher will be the value for whole-blood chloride. This obviously explains such results as those of Myers and Boenheim, already quoted.

TABLE IV

RELATION OF WHOLE-BLOOD CHLORIDE TO CELL-VOLUME

Case	Condition	Sex	Red Cells Vol. %	NaCl			
				Plasma %	Cells %	Whole-blood Found %	Whole-blood Calcd. %
P.	Normal	Male	48	0.61	0.32	0.48	0.47
M.	Normal	Male	44	0.60	0.27	0.47	0.46
M.	Normal	Female	39	0.62	0.32	0.50	0.50
G.	Normal	Female	35.5	0.59	0.31	0.51	0.49
P.	Chronic chlorosis	Female	31	0.58	0.33	0.52	0.50
M.	Chronic chlorosis	Female	28	0.60	0.35	0.53	0.53
U.	Carcinoma of stomach	Female	23.6	0.60	0.30	0.53	0.53
D.	Chronic Nephritis; Syphilitic	Female	18.7	0.62	0.35	0.57	0.56
N.	Classical chlorosis	Female	12.7	0.65	0.37	0.61	0.61
S.	Pernicious anæmia	Male	9.5	0.62	0.20	0.60	0.58

A definite source of error in the estimation of cell chlorides after centrifuging to separate cells and plasma will arise unless special precautions are taken to exclude contact with air until the actual samples are separated for analysis, and is due to loss of carbon dioxide to the air, and resulting interchange of chloride and other ions between cells and plasma (cf. Fridericia,[18] 1920; Dautrebande and Davies[19], 1922; Warburg,[20] 1922; Austin, Cullen, Hastings, McLean, Peters and Van Slyke,[21] 1922; Burger,[26] 1925). A series of comparisons have been made of plasma chlorides in samples of the same bloods, in one of which blood was taken in the usual fashion, so that some degree of contact with air took place, and in the other air-contact was rigidly excluded by the procedure to be described immediately.

Of 18 normals 11 gave a smaller value for specimens sampled without air contact, and the average difference of all was 0.01 per cent less for such samples. Of 12 cases of pernicious anæmia 8 have the smaller value for the non-ærated sample and again the average difference of all for such samples was 0.01 per cent less. Of 11 cases of secondary anæmia 6 gave the smaller value for the non-ærated sample, with the same average difference, 0.01, for all, and of 9 cases of chronic chlorosis 7 gave the smaller value for the non-ærated sample, and the 9 averaged 0.015 per cent less. (In each series several cases gave identical results.) The average difference, though small, and of the same order as the limit of error of the experimental method, nevertheless becomes a possibly important error, when applied to analyses of the red blood-cells in the anæmias.

For example, if a case showed a red-cell volume of 20 per cent, and hence plasma volume of 80 per cent, and gave plasma chlorides without air-contact amounting to 0.59 per cent, and with air-contact 0.60 per cent, 80 c.c. of the latter plasma contained 0.01 per cent NaCl (actually 0.008 gm.) which had been transferred from 20 c.c. corpuscles, so that the cells will have lost 0.04 per cent of their chloride content. If the relative volumes were 10 and 90, then the loss from the corpuscles through this error would be 0.09 per cent. Obviously such errors are not negligible, and lead to too low results. On the other hand, incomplete centrifuging will lead to slightly too high values for the cell chlorides.

We have accordingly used a procedure based on that followed by Gram[15] (1924), but have not used defibrinated blood, and have estimated the cell-chlorides directly. Material was taken in the morning, before breakfast. Blood was drawn directly from an arm vein into a syringe containing two drops of 20 per cent potassium oxalate solution (the constant error in volume introduced by this admixture, about 1 per cent, was neglected). The piston of the syringe had been previously coated with vaseline, and the needle was cemented to the syringe with wax. The syringe was inverted several times to ensure mixing of blood and oxalate. The blood was then discharged below the surface of liquid petrolatum contained in a 15 c.c. graduated (and standardized) centrifuge tube, with constricted neck. With the technique employed 10 c.c. of blood never came in contact with more than 0.1 c.c. of air (the bubble contained in the bore of the needle). The tube was closed with a rubber

cap, and immediately centrifuged at 3,000 revolutions per minute for 90 minutes (our own experiments confirmed previous observations that this effected practically complete separation of cells and plasma). Then one c.c. of plasma and one c.c. of cells were pipetted off separately, using standardized pipettes, and analyzed by the Van Slyke[27] (1923) micro-procedure. The liquid petrolatum used contained no trace of chloride.

Van Slyke's technique calls for six hours' acid digestion of plasma, and still longer of whole blood. We have found that two hours' digestion of plasma and whole blood uniformly gives a clear yellow fluid, while six hours' digestion is suffiicient for cells. The longer period of digestion suggested by Van Slyke does not appear to be necessary. Thus four estimations with two-hour digestion of a sample of whole blood gave respectively 0.50, 0.49, 0.50, 0.49 per cent chloride, averaging 0.495, and four estimations with four-hour digestion of the same sample gave 0.49, 0.49, 0.49, 0.51 per cent, averaging 0.495. For another sample two-hour digestion gave in two estimations 0.49 and 0.48, and four-hour digestion 0.49 and 0.49. Hence we have digested for two hours for plasma and whole blood, and for six hours for cells.

The maximum error of the method would appear to be chiefly conditioned by error in pipetting, which can be regarded as constant, and by the size of the drop used in the final thiocyanate titration. This was approximately 0.05 c.c., and since N/50 thiocyanate was used it can be calculated that one drop in excess corresponds to an error of 0.006 gm. NaCl per 100 c.c. of the fluid under examination, whence the probable error is of the order of 0.01 per cent. All plasma and whole blood determinations were carried out in duplicate. Scarcely any showed a difference of 0.02 per cent, and none exceeded this. Of duplicate determinations on 14 samples of whole blood selected from our records at random 8 agreed absolutely, and the remainder differed by 0.01 per cent. Of 14 similar plasma determinations 10 agreed absolutely, and 4 differed by 0.01 per cent.

Any error in the estimations of cell chlorides depending on incomplete drainage of the viscous mass from the pipette was almost entirely prevented by drawing up petrolatum into the pipettes before use, when, after draining, a thin film remained. On pipetting up the cells this film was displaced upwards. The pipette was subsequently washed twice with a small amount of petrolatum, and the washings added to the cells; the presence of this small amount of petrolatum did not affect the subsequent analysis. Any lowering of cell volume consequent on incomplete drainage should tend to give slightly low results. We have observed that in blood from pernicious anæmia cases the cells appeared to be removed from the pipette even more completely than with normal bloods, so that the error from this source is if anything less for pernicious anæmia cases than for normals.

During the development of our technique, and while the various sources of error were becoming apparent to us, we carried out a number of estimations of plasma and whole blood chlorides, in which the blood was collected in the usual way (so that contact with air was not prevented) and Whitehorn's[22] method (1920) was employed for analysis. As has been shown the error from the partial æration is of the order (for plasma) of 0.01 per cent too high. This does not enter into the whole blood analyses. Direct comparison of the Van Slyke and Whitehorn procedures on samples of three plasmas gave respectively 0.58, 0.58; 0.61, 0.60; and 0.62, 0.62; and on samples of three whole bloods, 0.54, 0.54; 0.56, 0.55; 0.60, 0.58, so that values obtained by the two methods are obviously comparable. In practice the Van Slyke technique is easier, but requires more time.

Our results (excluding cases in which cell chlorides were not determined) by the rigorous technique outlined above are shown in Tables V. and VI. The averages of the duplicate determinations of plasma are given. Details of the blood pictures supporting the clinical diagnoses are included. See Tables V and VI.

These three tables show that the plasma chlorides remain remarkably constant, approximating to 0.60 per cent, and that the extreme limits show little alteration in the various anæmias. An earlier series of eight pernicious anæmias in the active stage, analyzed by the Whitehorn procedure, without exclusion of air-contact before sampling, gave for plasma chlorides extremes 0.56 to 0.64, and average 0.60, while in five others in which plasmas only were determined by the Van Slyke procedure, and without exclusion of air contact, the extremes were 0.58 to 0.67, average 0.62.

TABLE V

BLOOD CHLORIDES IN NORMAL INDIVIDUALS

Subject	*Sex*	*R.B.C.* $\times 10^6$	*Hb* %	*Colour Index*	*Cell Volume* %	*Plasma NaCl* %	*Cell NaCl* %
Pa	Male	5.4	97	0.89	48.2	0.61	0.32
Mc		6.3	100	0.79	....	0.57	0.31
Or		5.2	94	0.92	40.0	0.61	0.30
Fi		5.5	84	0.76	....	0.58	0.29
Su		5.3	100	0.96	43.9	0.59	0.28
Me		6.1	100	0.83	44.0	0.60	0.27
Tu		5.9	98	0.85	45.7	0.60	0.27
Ca		5.4	102	0.94	45.5	0.55	0.26
Ke		5.6	94	0.85	42.4	0.60	0.26
Ha		5.4	104	0.98	....	0.64	0.23
Me	Female	4.5	98	1.11	39.0	0.62	0.32
Ma		6.3	100	0.81	....	0.59	0.32
Gi		5.3	93	0.88	35.4	0.59	0.31
Co		5.2	104	1.00	42.0	0.60	0.31
Wi		4.9	90	0.94	43.5	0.58	0.30
Su		4.7	90	0.95	....	0.61	0.29
Ri		4.9	101	1.03	....	0.59	0.26
Os		5.2	90	0.88	....	0.59	0.26
Fe		5.7	96	0.86	35.8	0.60	0.26

TABLE VI

BLOOD CHLORIDES IN THE ANÆMIAS

Case	*Sex*	*Condition*	*Known Duration Years*	*R.B.C.* $\times 10^6$	*Hb* %	*Colour Index*	*Cell Vol.* %	*Plasma NaCl* %	*Cell NaCl* %
Ke	M.	Pernicious An., Nervous, init.	....	4.4	88	1.01	39.7	0.61	0.30
Sc	M.	" " , active	1.5	2.0	46	1.21	22.3	0.60	0.28
Da	M.	" " , nervous, init.	....	5.8	85	0.75	44.0	0.56	0.26
Br	M.	" " , active	0.7	1.7	34	1.00	16.5	0.59	0.26
Sw	M.	" " , active	2	2.8	65	1.23	....	0.58	0.25
Mo	M.	" " , active	2	1.6	36	1.12	16.4	0.60	0.25
Bi	F.	" " , nervous, init.	2	4.0	85	1.09	43.0	0.60	0.23
Ha	M.	" " , active	5	3.1	52	0.64	23.0	0.61	0.22
Sp	M.	" " , active	5	0.8	20	1.42	9.5	0.62	0.20
Pa	F.	" " , active	4	1.3	29	1.11	13.0	0.62	0.20
Mu	M.	" " , active	0.1	2.7	58	1.08	20.0	0.60	0.20
Fi	M.	Pernicious anæmia, in remission	1.5	5.0	78	0.83	43.0	0.57	0.30
Br	F.	" " " "	2	3.2	41	0.68	21.0	0.62	0.35
Ha	F.	" " " "	1.3	3.8	75	1.04	....	0.61	0.27
An	F.	" " " "	1.5	2.4	47	1.02	....	0.60	0.24
Ll	F.	Chr. Hæmorrhage	0.4	3.7	55	0.76	31.9	0.63	0.39
Ro	F.	?	....	3.8	29	0.39	17.8	0.59	0.35
De	F.	Chronic Nephritis; Syphilis	0.5	2.1	35	0.87	18.7	0.62	0.35
Th	M.	Carcinoma of stomach	....	2.6	21	0.50	13.0	0.56	0.34
St	F.	Abortion	0.4	4.2	40	0.49	22.7	0.57	0.32
St	M.	Gun shot wound	0.04	2.4	45	0.93	19.7	0.58	0.31
Ur	F.	Carcinoma of stomach	....	5.3	51	0.48	23.6	0.60	0.30
Cr	F.	Hypernephroma	....	4.2	57	0.68	32.8	0.58	0.29
Tho	F.	Abortion	0.06	2.6	39	0.75	19.4	0.61	0.27
Sti	M.	Subacute bact. endocarditis	0.5	2.1	35	0.83	20.2	0.57	0.27
Ca	M.	Rheumatoid arthritis	3	4.0	58	0.74	43.1	0.58	0.24
Br	F.	Chronic chlorosis	....	4.3	36	0.43	24.0	0.61	0.39
Ro	F.	" "	....	5.3	60	0.56	34.3	0.59	0.36
Cr	F.	" "	....	4.0	44	0.55	27.8	0.60	0.35
Co	F.	" "	....	4.9	45	0.47	27.5	0.60	0.34
Pi	F.	" "	....	4.6	50	0.54	31.0	0.58	0.33
Li	F.	" "	....	4.8	44	0.46	27.4	0.60	0.33
Ir	F.	" "	....	4.8	70	0.73	41.5	0.62	0.27
Mc	F.	" "	....	5.1	52	0.51	30.8	0.57	0.26
St	F.	" "	....	3.9	38	0.50	24.7	0.61	0.24
No	F.	Classical chlorosis	1.1	2.2	17	0.39	12.7	0.65	0.37

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TABLE VII

SUMMARY OF CHLORIDE RESULTS WITH ACCURATE PROCEDURE

No. of cases	*Condition*	*Plasma–NaCl*		*Cell–NaCl*	
		Extremes %	*Mean* %	*Extremes* %	*Mean* %
10	Normal males	0.55—0.64	0.60	0.23—0.32	0.28
9	Normal females	0.58—0.62	0.60	0.26—0.32	0.29
11	Pernicious anæmia, act	0.56—0.62	0.60	0.20—0.30	0.24
4	Pernicious anæmia, rem	0.57—0.62	0.60	0.24—0.35	0.29
11	Hæm. sec. anæmias	0.56—0.63	0.59	0.24—0.39	0.31
9	Chronic chlorosis	0.57—0.62	0.60	0.24—0.39	0.32
1	Classical chlorosis	....	0.59	....	0.37

The figures of Tables V. and VI. are summarized in Table VII.

The results with plasma support Gram's conclusion as to the invariability of the plasma chloride content.

Careful consideration of the figures for cell chlorides reveals definite differences. The lowest normal figure, 0.23 per cent appears to be correct, since two determinations, on September 11 and October 22, on this apparently normal student gave respectively 0.229 and 0.236 per cent. Gastric analysis showed a delayed, and perhaps low free acid curve.

There appears to be a slight but undoubted lowering of cell-chlorides in the active phase of pernicious anæmia (sometimes non-existent when nervous symptoms alone are present, as in two of the three cases designated "nervous, initial", in Table VI.). This seems usually to become more marked the further the hæmolytic stage has progressed. This finding is not in agreement with that of Gram. This investigator calculated his cell-chloride content from values for plasma and whole blood chlorides, and the known cell volume, and himself remarks "when the cell volume is small any errors in the actual analyses are magnified in the calculated cell chloride concentrations."

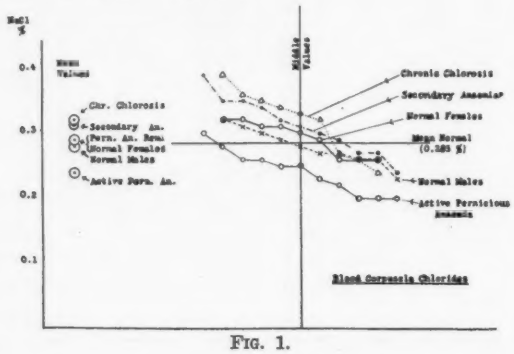

FIG. 1.

On the other hand the average figures for cell chlorides in the remissive stage of pernicious anæmia, and in the other anæmias studied, show fair agreement with those of normal individuals, though the averages are slightly higher, and the extremes show wider variations. See Fig. 1.

These results for cell chlorides are shown graphically in Fig. 1, in which the chloride values are arranged in descending order from case to case in each series, the middle value of each series being placed in vertical order from series to series. The shift towards lower values in the cases of active pernicious anæmia is obvious.

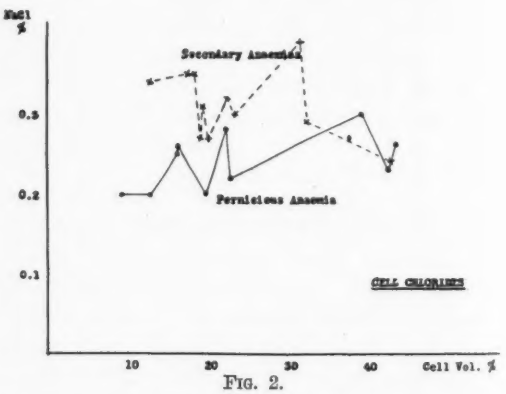

FIG. 2.

The average difference between the active pernicious anæmia cases and normal means is 0.04 per cent. It has been pointed out that air-contact might permit an error of this order in cases where the cell volume was only 20 per cent. That our technique prevented such an error is shown in Fig. 2, in which the chloride values are plotted against cell volume for the active pernicious anæmias and the secondary anæmias of hæmolytic or hæmorrhagic origin. If the lowered values were due to an error through insufficient protection from air, then the lowered

cell volumes in the secondary anæmias should similarly be accompanied by lowered cell chlorides; the two curves should be parallel and practically coincident. They are widely divergent. See Fig. 2.

4. The normal or abnormal distribution of chlorides in the tissues in the anæmias.—No accurate figures are yet available for the distribution of chlorides in normal tissues. Until these have been determined study of the distribution in pathological conditions cannot properly be attempted.

Summary

Of sixteen cases of pernicious anæmia in the active phase and ten in remission none showed presence of hydrochloric acid in the gastric secretion. This is in full agreement with almost all previous observations.

Evidence is adduced that in pernicious anæmia not only is there complete gastric achlorhydria, but further, that in some if not all cases, the chloride ion is absent from such gastric secretion as may occur.

Of six cases of pernicious anæmia examined for peptic activity three showed no activity, two very slight activity, and in one the activity was somewhat below normal.

The dependence of the value of whole blood chloride upon the proportion of cells to plasma is emphasized. Determinations of whole blood chlorides are valueless for most clinical purposes.

The plasma chloride content is relatively constant and normal in the anæmias.

In the active stage of pernicious anæmia, especially when the hæmolytic changes precede nervous symptoms, there is a slight but undoubted lowering of cell chlorides.

In the remissive stage of pernicious anæmia, and in the other anæmias studied, the average figure for cell chlorides does not markedly differ from normal, but the extremes show wider variations.

There is in the active stage of pernicious anæmia a marked upset in chloride metabolism, characterized by lowering of the blood cell chlorides, and, in some if not all cases, *by the absence of the chloride ion (as well as hydrochloric acid) from any gastric secretion that occurs.* The former abnormality may disappear in the remission stage. Further work is necessary to determine whether there is definite chloride retention in pernicious anæmia.

We do not propose at present to discuss the bearing of these results on the underlying causative factor of the disease.

We wish to express our thanks to Dr. E. W. Montgomery for his interest and helpful advice throughout the progress of this research, and to Miss Marion Foster for assistance with the chemical analyses.

We also wish to acknowledge our indebtedness to Drs. J. D. Adamson, J. E. Coulter, C. R. Gilmour, J. Halpenny, F. J. Hart, C. Hunter, D. H. McCalman, D. F. McIntyre, N. J. Maclean, E. W. Montgomery, A. W. Moody, H. M. Murdoff, D. V. S. Winkler, and the staffs of the Winnipeg General and St. Boniface Hospitals for permission to examine patients.

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THE DIAGNOSIS AND TREATMENT OF OBSTRUCTION OF THE SMALL INTESTINE IN ADULTS

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IN a lecture upon obstruction of the bowels delivered seventy-five years ago Thomas Watson said: "Our doubts and indecision, as in almost all questions of conduct, are the doubts and indecision of ignorance; ignorance in the earlier periods when the operation might be more hopefully attempted, whether the obstacle be really insuperable by other means; ignorance whether, if so insuperable, it may be vincible by the help of operation." (Watson's Practice of Physic.)

The progress of years has dispelled our doubts concerning the vincibility of intestinal obstruction by operation but doubt still persists "in the earlier periods whether the obstacle be really insuperable by other means," i.e., whether the obstacle be really mechanical in nature, a diagnostic doubt which begets indecision and delay. This is attested to by several facts. First, the severity of the onset symptoms brings the doctor (usually a general practitioner) to the patient early, often within a few hours. Second, the lists of cases published show that the majority of obstructions due to strangulated hernia are recognized and treated early, while of those due to intra-abdominal lesions, only about 30 per cent are so treated. The same set of subjective symptoms are present in both groups, but one has an external sign, the irreducible mass at a hernial orifice, which promptly removes the doctor's uncertainty. Without the external mass he remains in doubt until some of the late symptoms so much stressed in his textbooks appear.

In a previous paper* I expressed the opinion that the delay in diagnosis and consequent high mortality could be attributed to the comparative infrequency of the disease, (approximately one case in every 10,000 population yearly,) but especially to the lack of a clear description of the early stage in the text-books in use by students and practitioners, and I made an attempt to formulate an early stage clinical picture from a small group of cases.

This paper presents a study of 95 cases of acute obstruction of the small bowel in adults. Thirty-four were patients of several colleagues, to whom I am indebted for the privilege of examining their hospital records, and the remaining 61 were my own cases. The 95 cases have been divided for the purpose of this study into two groups, primary obstructions and obstructions secondary to peritonitis either localized or diffuse.

Group 1.—Comprises 69 cases of primary obstruction due to strangulated external hernia, constricting bands, adhesions with kinking and torsion, gall stone obturation, and intussusception in adults. The data obtained from the records of these 69 cases warrant the following statements:

1. Pain, griping in character, diffused across the abdomen, varying in intensity from mild to agonizing and causing the patient to toss about, was present in all cases. Rarely this peristaltic pain may subside almost completely owing, possibly, to exhaustion of the neuro-muscular apparatus. Another pain constant in character, but comparatively mild, due to pinching of the peritoneal covering of the bowel by the obstructing agent, is usually present and its site is sometimes recognized by the patient.

2. Vomiting is a constant symptom. It arises from two causes: First, the vomiting of peritonism due to pinching of the peritoneal covering of the bowel involved, occurs immediately, or within an hour, after the onset of pain. Vomiting from this cause, however, is not always met with. Secondly, vomiting occurs as the result of the arrest of the fæcal current, beginning from two to six hours after the onset of the pain. The higher the obstruction, the earlier the onset of this type of vomiting. Ingesta of all kinds are rejected. Gastric lavage temporarily stops

* *C. M. A. Journal*, Sept., 1920.

it. In the first twenty-four hours the vomitus is never stercoraceous.

3. Shock. Some depression is associated with the vomiting of peritonism, but true shock is exceedingly rare. It occurred in mild degree in three of these 67 cases.

4. Pulse. In 39 cases coming under observation, during the first day, the pulse was less than 90 in 36, (92 per cent), and the average rate for the 39 was 78. On the second day, 22 of these 39 had not been treated by operation and were still obstructed, and 9 others were first observed on the second day, making 31 cases in which the pulse of the second day is on record. In 21, 70 per cent of these, it was less than 90, and the average rate for the 31 was 86. On the third day six cases came under observation, one with the rate of 66, another of 82 and an average for the 6 cases of 98. On the fourth day 8 cases were first observed, one had a rate of 54 and the average for the 8 was 112. The pulse rate was within normal limits during the first twenty-four hours in 90 per cent and during the second twenty-four hours in 70 per cent.

5. Constipation. Perhaps the most important step in making a diagnosis is the determination whether or not constipation is absolute. This can be done by the administration of a large S.S. enema, (2 to 3 quarts for adults). This enema may bring away considerable stool and flatus, the amount depending upon the time since the patient had a normal bowel motion; it is, therefore, necessary to repeat the enema at least once and usually a second time. Should both second and third enema be negative in result, it may be concluded that some form of obstruction is present.

6. Physical examination. During the first twenty-four hours the abdomen is soft, flaccid and insensitive, excepting during the acme of a peristaltic pain, when some muscular resistance is usually present. A limited area of tenderness may be elicited by palpation of the abdomen, or by palpation combined with the digital examination per rectum. When this is present, it gives a clue to the site of the obstruction. Distension of the abdomen is noted on 46 records as follows: on the first day in 5 cases, on the second day, in 12 cases, on the third day in 29 cases. The distension may have a dull rather than a resonant note to percussion, the dullness being due to liquid in the small bowel, which may also give a sense of fluctuation. This is found especially in those cases in which vomiting has been infrequent.

A clinical picture of primary acute obstruction of the small bowel in adults, based upon this study, may be stated as follows: During the first twenty-four hours, the only symptoms present are peristaltic pain, vomiting, constipation and very rarely a mild degree of shock. The abdomen is soft and flaccid and tympany is present in not more than 10 per cent of the cases. The pulse is within normal limits in 90 per cent. The facial expression is normal except during the paroxysm of pain.

During the second twenty-four hours, in addition to the above symptoms, there will be found slight distension of the abdomen in 25 per cent, and in 30 per cent an accelerated pulse rate. During the third day, vomiting becomes stercoraceous in 10 per cent, the pulse more rapid, distension more marked and some of the other distressing symptoms described in the textbooks begin to appear.

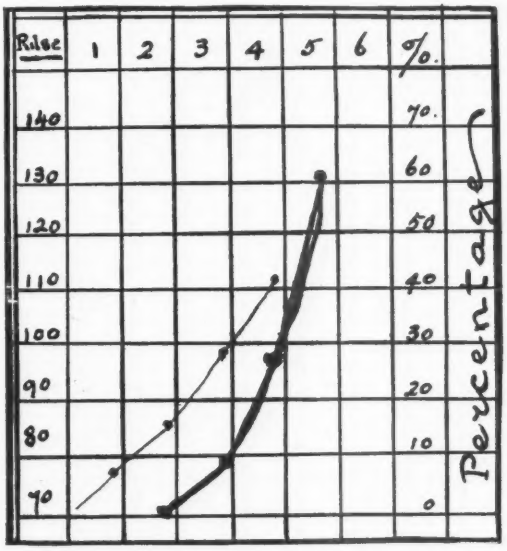

FIG. 1.—Pulse, light line. Stercoraceous vomiting, heavy line.

The early stage may be defined as that period during which the only symptoms are peristaltic pain, vomiting and constipation. Its duration varies from twenty-four to seventy-two hours; in 90 per cent of cases it continues more than thirty-six hours after the onset. It is shorter in cases with coincident arrest of the blood circulation especially if a considerable segment of intestine be involved, and in cases of high obstruc-

tion; the higher the obstruction the earlier is the appearance of grave symptoms. The pulse rate and the incidence of stercoraceous vomiting are represented graphically in Fig. 1.

Group 2.—Obstruction secondary to peritonitis. There were 26 cases in this group. In sixteen the obstruction was due to a loop of ileum, adherent in the wall of an abscess, becoming kinked or twisted; and in ten the obstruction occurred as a complication of diffuse peritonitis and was chiefly due to inflammatory paresis. Both factors, the mechanical and paretic, however, are invariably present in these cases, the mechanical being dominant in the localized, and the paretic in the diffuse form. The symptoms of obstruction in this group consist in an exaggeration or recurrence of the symptoms of the pre-existing peritonitis, plus the evidence of the arrest of the fæcal current obtained by enemata. As the obstruction is at first incomplete, stimulation of peristalsis by enemata, pituitrin or eserine may cause the bowel to empty itself, possibly by breaking up a recently formed adhesion or straightening out an angulation. This however is done at the risk of spreading the infection. An early diagnosis will be promoted by remembering:

a. That so-called gas pains, especially if persisting unduly, should be regarded with suspicion.

b. That the recurrence of vomiting on the third post-operative day or later, is nearly always due to either acute dilatation of the stomach or intestinal obstruction, rarely to acidosis.

c. That negative enemata have the same significance in this as in the primary form of obstruction; and

d. That the toxic symptoms and vomiting associated with peritonitis are the result of partial obstruction and only indirectly the effect of the peritonitis.

Treatment.—There are four main indications.

1. The release of the bowel from the obstructing agent.

2. The removal of the toxic material from the distended proximal segment by enterostomy, preferably, under local anæsthesia, and by gastric lavage.

3. To combat the toxæmia by the administration of liquids intravenously, subcutaneously and per rectum, and by the use of salt solution as advised by Hayden and Orr.

4. The removal of gangrenous bowel.

a. In the early stage (as previously defined) of primary obstruction a release operation will, alone, effect a cure in 90 per cent of cases.

b. In the late stage of primary obstruction presenting the symptoms of severe toxæmia (rapid feeble pulse, Hippocratic facies, stercoraceous vomitus and distension), the most urgent indication is drainage of the proximal loop by enterostomy. Operation for release of the bowel, excepting in cases of external hernia, should, usually, be delayed until the patient's condition has been improved by the use of the measures already mentioned. An efficiently functionating enterostomy along with these measures will often in a few hours, convert a bad into a good risk for the necessary laparotomy. Failure to do so may be due to extensive gangrene or because a lethal dose of the extremely toxic proximal loop substance had already been absorbed. The need for enterostomy in addition to the release operation in these late primary cases is indicated by the fact that in seven (of the hospital cases) the symptoms of obstruction persisted notwithstanding that a viable bowel had been freed. These patients all lived more than twenty-four hours after the release operation suggesting the thought that had enterostomy been done at the same time, some of them would have been saved. The bowel, although viable, is too much damaged to function, obstruction persists and the patient dies from toxæmia before the bowel wall is sufficiently recovered to drive its contents onward into the normal distal segment where absorption of toxins is said not to occur.

c. In obstruction resulting from localized peritonitis (16 of the 26 cases in group 2.) enterostomy is, also, an essential part of the operation. W. Sampson Handley states that drainage of the proximal bowel is more urgent than drainage of the intraperitoneal abscess. Release of the bowel from the mass of adhesions forming the abscess wall may be done at the same time provided ample omentum is available for covering raw surfaces and for interposing between infected and non-infected areas. This however is rarely advisable on account of the risk of spreading infection, and in the majority of cases is unnecessary. In only two out of ten with this form of obstruction did the canal re-

main blocked and the enterostomy refuse to close spontaneously. In these two the continuity of the tract was restored by short circuiting operations done after the peritonitis had subsided.

d. Complicating diffuse peritonitis—ten cases. In this type the only operation indicated is enterostomy. No good can come from separating adhesions as was done in some of the hospital cases.

e. Enterostomy. The importance of draining the distended proximal segment has been recognized for a century. Nelaton in 1840 sutured "the most distended loop" to the parietal peritoneum, opening it some hours later, with a successful result. The Nelaton technique has, in recent decades, been displaced by the rubber tube introduced into the bowel and held in place by a purse string suture or by the method of Witzel; and instead of "the most distended loop" Victor Bonney in 1910 advised choosing a loop of bowel higher up usually the jejunum. Among my 59 operations for small bowel obstruction, enterostomy was a part of the operation in 5 late primary obstructions and in 15 cases secondary to peritonitis; in 4 of the latter it was the only operation performed. Fourteen of these 20 desperately ill cases were saved by the drainage of the proximal segment.

In 5 cases obstructive symptoms persisted after enterostomy. These symptoms were relieved and recovery followed in two after repeating the enterostomy on a loop higher up. Autopsy on two of the remaining three revealed obstruction proximal to the stoma. In all of the five the diffuse form of peritonitis was present. This indicates the advisability of choosing a high loop in this type of case.

Short circuiting operations, ileum to ileum or ileum to colon, combined with cæcostomy when the pelvic colon is disabled by peritonitis, was recommended by Handley (B.J.S. Vol. iii, 161). I tried short circuiting without cæcostomy in seven cases with unsatisfactory results. One died and five required enterostomy in order to save them. My experience supports the view that enterostomy is by far the most effective means we have in averting an impending fatality from acute obstruction. It is indicated in the late stage of primary obstruction and in all cases complicating peritonitis. It not only drains off the toxic material but also relieves the distension and permits rest of the imflamed proximal segment, thereby promoting its restoration to normal. With subsidence of inflammation the bowel wall recovers its peristaltic power and in the majority of cases the obstruction ceases. In twelve of the fourteen of my own cases surviving after enterostomy, the stoma closed spontaneously in from eight to twenty-four days. In only two did it refuse to close and in these laparotomy performed after subsidence of the inflammation, showed that obstruction persisted. The value of enterostomy appears from a comparison of the mortality rate of 33.9 per cent

Primary Obstruction:—						
Operation in early stage—	22	cases with	2	deaths		9.1%
" " late "	45	" "	20	"		44.4%
	67		22			32.8%
Not operated—	2		2			
	69		24			34.8%
Secondary Obstruction:—						
Operation in early stage—	5	cases with	1	death		20 %
" " late "	19	" "	14	"		73.7%
	24		15			62.5%
Not operated—	2		2			
	26		17			65.4%
Operation within 24 hours—	27	cases with	3	deaths		11.1%
" " 24–48 "	17	" "	5	"		29.4%
" " 48–72 "	21	" "	12	"		57.1%
" " 72–96 "	20	" "	12	"		60.0%
" " 96–plus "	6	" "	5	"		83.3%
	91		37			40.6%
Not operated—	4	" "	4	"		
	95		41			43.1%

in my own group of 59 cases in which enterostomy was resorted to in 20, with that of 53.1 per cent in the hospital group of 32 cases in which only two enterostomies were performed.

Mortality.—The above tables show the close relation between mortality and the stage during which opreation is performed. The term "early stage" is here used in the sense previously defined. In the secondary cases I have noted that the time between the apparent onset of complete obstruction and the occurrence of stercoraceous vomiting is shorter than in the primary cases. This is no doubt due to the presence of partial obstruction with consequent stasis in the proximal bowel for some time preceding.

Summary

1. The high mortality of acute obstruction of the small bowel is due to delay in operating. In primary cases this delay is due to doubt as to the diagnosis on the part of the practitioner; and this doubt is traceable, almost solely, to the defective (or entire absence of) description of the early stage symptoms found in the text-books of medicine and surgery in use by students and practitioners.

2. The three symptoms pain, vomiting and constipation verified by the enema test, alone, warrant a diagnosis of some form of obstruction.

3. It should be emphasized that stercoraceous vomiting, distension, rapid feeble pulse and symptoms of collapse belong not to the early stage but to the late moribund stage of intestinal obstruction; and that the welfare of the patient demands that a diagnosis should be made before the appearance of these symptoms.

4. Some decrease in mortality will follow from improvements in therapeutic methods, especially the more frequent use of enterostomy in the secondary and in the late primary cases, but a large decrease can only come from earlier diagnosis and operation.

The Anæmias Due to Radioactive Substances.—The contributions recently appearing in *The Journal* on the dangers of radioactive substances are both timely and elucidating. They warn against subtle menaces that represent practically a heretofore unrecognized form of occupational poisoning in which the use of radium, mesothorium and radiothorium plays a part. The timeliness of the scientific study of the untoward experiences of certain workers handling these products lies in the fact that the greater dangers at least can be averted by improved industrial procedures. What this may mean is indicated by the report that it has been possible in the past for employees unwittingly to ingest and absorb greater amounts of radioactive elements than are ever given in expectation of therapeutic results. The local effects of radioactive elements have been recognized for some time. In the case of the persons accustomed to introduce such products into the oral cavities through the objectionable habit of pointing in their mouths the tips of brushes dipped in luminous paints, the lesions are due to irritative radiation. Necrosis of the jaw may result. The harm is accentuated by the increased bacterial virulence of the organisms in the mouth caused by the irritative or stimulative effects of small amounts of radiation. Far more insidious, however, are the scarcely suspected remote effects of radioactive elements once introduced into the body. There is no known way of eliminating, changing or "neutralizing" them while, according to Martland and his co-workers, they form fixed deposits in the main organs of the reticulo-endothelial system, chiefly the spleen, bones, marrow and liver. Here they continuously emit radiations until they decay according to their individual life history. Primarily, in these situations, they act as irritants to the adjacent erythroblastic and leukoblastic centers. The studies have emphasized in unanticipated ways the serious late effects of such radioactivity in the body. As the latest investigators have described the effects on the hematopoietic system, small doses of radioactive elements increase temporarily red and white cell production. After a shorter or longer time, small or larger doses cause partial or almost total destruction of leukocytes and a diminution in the erythrocytes, producing a severe anemia that stimulates the pernicious anemias of regenerative and aplastic types. *Jour. A.M.A.*, Jan. 9, 1926.

ARTERIOTOMY FOR EMBOLUS OBSTRUCTING THE CIRCULATION IN AN EXTREMITY, ILLUSTRATED BY A SUCCESSFUL CASE

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EMBOLISM of one of the main arteries of an extremity, while not a common condition, is a decidedly important one. Its results (gangrene and amputation) are so serious as to call for special thought and effort along any line that offers reasonable hope of averting them.

These considerations, together with the fact that the potentialities of surgery in this condition are not frequently nor adequately emphasized for the general profession, suggest that this communication may be timely, and, may I hope be acceptable.

It has always been my experience until the present case, to see this condition for the first time when gangrene was established and amputation inevitable, and this it would appear is the experience of surgeons generally. Such experiences are real disapointments, and they but intensify the desire to apply sound surgical principles in the early hours of the condition, thereby removing the cause and preventing the otherwise inevitable result.

Arteriotomy to remove the embolus is sound in principle and reasonably safe in practice. It is not mutilating nor function impairing, and is wholly in accord with the ideal of prevention and conservation. Considering the problem from all angles and in the light of the published results of embolectomy, one can reasonably expect that amputation for gangrene due to embolic occlusion will become the exception instead of the rule. At any rate it should be at least our standard.

To accomplish this, prompt diagnosis and reasonably early opening of the artery, before secondary thrombus has formed, is necessary.

The diagnosis should not be a matter of difficulty in the early hours, for the features of arterial blocking are very striking and characteristic and the basic cause of embolus formation is usually not far to seek nor hard to determine.

If our contention is correct, that this condition is primarily a surgical one, our appeal must be made to the general practitioner for coöperation. He is the one who sees the case first as a rule, and on his mental attitude to this problem, and on the advice he gives in the first few hours after the onset, is the result then decided. The importance of the general practitioner and the surgeon seeing and thinking alike in respect of the surgical possibilities in the early hours, cannot be too much stressed. Their problem is the same, their objective the same, their interests the same. It is wholly, then, a matter of getting the same point of view in respect of principles and practice as they apply to this condition.

One is surprised to find that the first successful case of embolectomy was done as recently as 1911. This was a case of embolus of the common femoral artery, and the operation was done by Labey, six hours after the occurrence.

The second, also a common femoral block, was done one year later by Dr. Einar Key of Stockholm—also six hours after the occlusion.

In October, 1922, Key[1] reported having performed the operation of embolectomy ten times on nine patients, covering femoral, popliteal, brachial and axillary arteries, and in one case the bifurcation of the aorta.

In addition to these and several done by Swedish confreres, he collected from the literature fifty-one reported cases. In his own cases the shortest time between the occurrence of the arterial blocking and operation was two hours, and the longest four days. None of the cases operated on over twenty-four hours after the onset were successful, but it is encouraging to note that of his eight cases operated on within twenty-four hours, there was an entirely successful result in six (or 75%). Two became gangrenous, and there were no deaths.

Of the collected cases thirty-six were done

within twenty-four hours and sixteen were entirely successful, twelve developed gangrene, and eight died soon after operation.

Though these results are not as good as Key's, it must be admitted that it is a great improvement over 100 per cent. with gangrene and amputation, as a result of the expectant method, and it is reasonable to state that the number of deaths would in an expectant method group be more and not less, for we must weigh the greater danger of amputation for gangrene against embolectomy and its minor risks, and in the event of embolectomy failing to restore adequate circulation it does not increase the risk of amputation, assuming that no infection has occurred.

It is obvious that the age of the patient, the state of health and the circulation, the condition of the artery at and distal to the embolus, and the condition of the arteries generally, are important factors in determining the success or failure of embolectomy. But without any attempt to differentiate the cases with a favourable clinical setting, from those with an unfavourable background, it may be stated as a general principle that a successful outcome depends on two factors: early diagnosis and early operation. It must be kept in mind that secondary changes occur in the vessel wall at the site of the embolus (reaction in the intima), important changes about the embolus (the formation of spreading secondary thrombus) and changes in the tissues of the extremity distal to the vascular block. If these have progressed beyond a certain degree, the time for successful embolectomy has passed.

It would appear that in some cases these secondary changes, e. g. secondary thrombus, occur more slowly than in others. This however is not a measurable quantity clinically and does not encourage delay in operation.

The Case Report.—Mr. J. A., aged sixty-five retired business man, was taken to the Victoria General Hospital May 16, 1924, complaining of abdominal pain, swelling of the abdomen, vomiting and constipation. There was nothing of importance in his personal history until one year before, when he was confined to bed for about six weeks on account of failure of cardiac compensation, with œdema and orthopnœa, due to myocardial disease with dilatation. At all times since recovery, slightly more than ordinary gentle exertion caused shortness of breath and other signs of small cardiac reserve; but he was able to be about on foot daily until three weeks prior to entering hospital when he was advised by his physician to go to bed in anticipation of another cardiac breakdown. During this three week period, he was taking digitalis.

Renal Embolism.—On the day before admission to the hospital he was suddenly seized with severe pain in the left abdomen, faintness and vomiting. The abdomen became greatly distended and tense, and all efforts to move the bowels were without success. He was sent in with a provisional diagnosis of acute intestinal obstruction.

On admission, as a result of systematic questioning and examination, the following facts were established: (a) The abdominal pain was in the left loin as well, and definitely radiated forward and downward to the brim of the pelvis; (b) Maximum tenderness and rigidity were in the left loin; (c) Red blood cells were abundant in the urine; (d) x-ray revealed no shadow suggesting stone, and rectal examination was negative.

The history, the above definite findings, and the further results of a systematic physical examination, left no doubt that we were dealing with a case of left renal embolism. He was treated accordingly and the symptoms rapidly disappeared.

The Occurrence of Embolism of the Common Femoral Artery.—I visited him in the hospital on the morning of the fourth day after his kidney seizure. He was in bed, had no complaints, his colour and general appearance were good. He felt so well that he was in a very happy state of mind and inclined to joke about his trouble that was so real four days before.

Soon after, when passing his room, he called me and stated that "something very strange" had happened to his right leg "just within the past five minutes"; that "it began with numbness and tingling in the foot and leg" and a feeling of "soreness" and "stiffness" in the popliteal space. At that moment he said: "I feel the foot and leg numb, tingling, heavy and dead, but there is no pain."

The skin of the foot, leg and the thigh was strikingly white in contrast with the normal side; and while he could move the toes and foot,

it was with difficulty, rather feebly and within small range.

To touch, the skin was definitely not so warm as on the normal side. Sensation to pinprick and pinching was slightly impaired and in about twenty minutes there was complete anæsthesia over foot and ankle. Within one hour sensation was gone as far as the knee, and the power to voluntarily move the toes and foot was completely lost. The knee could be flexed, but in a clumsy and feeble way and to a limited extent. The leg as a whole could not be voluntarily raised from the bed. At this time (one hour) the foot and leg were of marble whiteness and from the knee upward to a point three inches below Poupart's ligament there was a light purple mottling of the skin with slow return of the colour after finger pressure.

The line between this mottled area and normal skin of the upper three inches of the thigh was as sharply defined and uniform as if made by a fine pencil, except in the adductor area, where the mottling was of irregular outline and reached nearly to the perinæum.

At no time could pulsation be found below this line, but it was visible and palpable a short distance above it.

Careful palpation failed to reveal any localized resistance, or other feature, even suggesting palpability of the embolus. In three hours the foot (and to a less degree the leg) had a corpse-like feel and appearance. The withered, shrunken and deadly white appearance was striking.

It was in the popliteal space, however, and there only, that he noted discomfort or slight pain and some tenderness. The view taken of this, was that it was a referred sensation and did not indicate the site of the embolus.

The diagnosis and location being assured, my wish was to operate at once, but for special reasons, not necessary to relate, the operation was not done until nearly seven hours after the block occurred.

The Operation.—Local anæsthetic (novocaine 1 per cent.) was employed by infiltrating the skin and deep tissue of Scarpa's triangle along the course of the femoral artery. The artery was exposed by a three inch incision. At the bifurcation of the common femoral and for three-quarters of an inch above it, one could palpate the firm unyielding blocked section of the artery. It was definitely solid, and the contrast between the full, pulsating artery above and the empty, pulseless, compressible one below, was very striking. The vessel was gently released from its bed to permit the application of a mildly compressing clamp, adjusted with great care to avoid traumatism of intima or arterial wall. This was deemed better and safer than a temporary ligature. The artery was incised in its long axis below the solid portion and just sufficiently over the latter to expose the distal end of the embolus, so that it might be seized or hooked by instruments without possible injury to the intima. The vessel wall was found to be in good condition. There was no sign of atheroma.

The embolus was firmly packed in the vessel as if "tamped," and completely occluded the lumen. On trying to pull it out with forceps it broke, and the remaining half was "hooked" out with the assistance of the pressure of blood behind it (the clamp having been temporarily released). A forcible gush of blood was allowed for an instant to assure the washing out of all loose particles.

The intima at the site of thrombus was normal, except for slight dulling of its lustre.

The Embolus.—The embolus was about seven-eighths of an inch long and weighed twenty-seven grains. Its large size was a surprise to us all. In the main it was firm and fairly tough. Its surface was here and there shaggy and porous-looking, and in all parts had an old greyish red appearance, as if partly "washed out."

To each end of the embolus recent dark red clot was attached (secondary thrombus); at one end but a small bead, at the other a tap root-like clot one-half or three-quarters of an inch long.

Technique.—The soft clamp easily controlled and readily adjusted to the requirements seemed preferable to any form of temporary ligature. All instruments were kept in a two per cent. solution of sodium citrate, and the wound was kept constantly moist with a small spray of this solution. The artery was handled gently, as little as possible, and disturbed in its bed only enough to apply the clamp. The incision in the artery was planned, and the manipulations to extract the embolus performed

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so that the removal would be made easy and without injury to the intima, thus avoiding what might lay a foundation for a thrombus which would again block the vessel. Fine silk through the adventitia was used in lieu of retractors and to steady the vessel.

The incision in the vessel wall was made with a very sharp small knife.

Fine silk and the regular fine "artery needle" were used to close the incision. Two rows of interrupted sutures were used. The first, or deep row, in mattress form, was placed so as to be outside the intima and put its cut edge away (if possible) from contact with the blood stream, while the outer or second row brought the adventitia together.

Results.—After suturing the arterial wound and releasing the clamp, strong pulsation appeared immediately in the popliteal space and the foot. Within one minute the shrunken, corpse-like appearance of the leg and the mottling of the thigh gave place to a rosy healthy looking cne. Within two minutes the patient was able to move the toes and foot smartly and naturally. The sensation of "weight and deadness" was gone and "the natural feel" was restored. Within five minutes sensation to pin prick was well restored in the foot to slightly below normal, and within one hour it was quite normally acute in all parts of the extremity.

The wound healed by first intention, and at the end of two weeks the patient went home. The function and appearance of the leg were normal and he had no sensory disturbance. He was soon able to walk as well as ever.

Periodic examination showed no unfavourable results nor sign of weakness of the arterial wall at the site of incision. He was able to be about with normal use of the leg for about eight months after the operation, when he died suddenly of a heart attack.

REFERENCE

(1) KEY *Jour. Surg., & Obst.*, vol. xxxvi, No. 3 (March, 1923).

Lymphaticostomy for Peritonitis. — C. H. Whiteford discusses lymphaticostomy—the operation of exposing and draining temporarily the cervical portion of the left thoracic duct—in the treatment of peritonitis. This operation aims at preventing the blood stream from receiving bacteria and toxins from an inflamed peritoneum and intestines. In costain's procedure under general or local anæsthesia a 3-inch incision is made along the lower posterior border of the left sterno-mastoid muscle, and the jugular vein is rolled forwards to expose the thoracic duct. This is tied with catgut close to its termination, a narrow strand of rubber being passed into it through a half-inch incision in its long axis. In order to preserve the lumen of the tube and to provide a method of stopping the escape of chyle through the fistula without further operation, Whiteford recommends using a cannula retained in the duct by a half-tied catgut ligature round it; this ligature can be completely tied after the cannula is removed should it be necessary to stop the escape of chyle; or if unwanted it can then be removed. Permanent or prolonged obliteration of the duct appears to accentuate the risk of a flow from the fistula, causing death by starvation, and the preservation of the lumen is important in order that the chyle may be permitted later to resume its original route. Costain, who first performed the operation in 1922, considers that it is indicated in secondary peritonitis as an adjunct to local treatment; when symptoms of continued septic absorption persist after abdominal operation; and in primary peritonitis especially due to pneumococcal infection. A. Cooke (ibid., p. 309) gives four case reports in which the operation was performed for general peritonitis. Assuming that it is of value when a general peritonitis is of such severity as to warrant its performance, in addition to the removal of the cause, he points out that between the extremes of a moribund patient and one in whom the prognosis is good under ordinary methods of treatment there is a fairly large class, in which the mortality may be gauged as over 10 per cent, for whom the operation may afford a chance of recovery.—*Brit. Med. Jour.*, Nov. 28, 1925.

THE INDUSTRIAL PHYSICIAN*

By W. Irving Clark, M.D.

Surgeon: Norton Company, Worcester, Mass.

INDUSTRIAL medicine is a very new branch of medicine. It is really the application of medicine to industry and started about fifteen years ago. It differs in no way from the practice of medicine elsewhere except in the necessity of adapting the work so that it fits into the needs of industry and does not conflict with other requirements of the factory. The doctor who is doing work in industry has to consider a number of things which the physician practicing in the community does not have to consider. He has numerous responsibilities which the physician practicing in the community does not have.

Although industrial medicine has been called a specialty the physician in industry is definitely a physician in industry and is not a specialist in the way in which one would consider an eye, nose, or throat man a specialist, but he is obliged to know a great deal about industrial work, about the departments with which he comes in contact, about the type of work which the employees are doing, as well as about the sanitation and the hygiene of the factory. He is also frequently obliged to consider community problems and to have the point of view of one specializing in public health. An industrial physician has been defined by the Conference Board of Physicians in Industry as follows: "A physician in industry is one who applies the principles of modern medicine and surgery to the industrial worker, sick or well, supplementing the remedial agencies of medicine by the sound application of hygiene, sanitation and accident prevention, and who in addition has an adequate and co-operative appreciation of the social, economic and administrative problems and responsibilities of industry in its relation to society."

Twenty years ago, except in a few isolated instances, there was no practice of medicine in industry except as done by the physician in the ordinary course of his duties in the community. However, rapidly expanding factories, with their constant demand for new workers, gradually built up great organized communities where large numbers of workers were thrown together in close proximity at their work under conditions which were frequently far from ideal. Whereas, thirty years ago over one-half of the population of the United States was devoted to agriculture, at the present time less than one-half are so occupied and from being a pastoral country, it has become a manufacturing country. Not only did the grouping of these large numbers of men in factories produce changes in the health conditions due to unhygienic surroundings, but it also introduced the particular hazards which always exist in industry as a whole. These hazards consist of the danger of accident and in many cases the danger of intoxication by some special poison developed during the production processes. Up to fifteen years ago, these dangers received no consideration by the medical profession. When it became evident that certain conditions existed, it was evident to manufacturers, that something must be done to meet this changing situation, and that the employer had a definite responsibility for the health and safety of his employees.

The employer also saw that there was an economic principle as well. If his employees were losing time because of sickness and accidents, and because of wrong hygienic conditions, from a purely economic point of view it was to his advantage to do something in the way of prevention. It was thus that a contact between manufacturers and physicians began to be established. The first question was what should be done and how it should be done. As one would expect, the large factory group was the first unit to take up this problem. Here it seemed to be especially necessary, because in the small factory there was still a contact between the employer and the employee. The employer frequently assisted the employee in times of sickness, or accident, and

* An address delivered at the Annual Symposium of the Committee on Industrial Medicine, O.M.A., December 9, 1925.

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because of his close contact with the plant realized at once working conditions which were unsatisfactory. Unfortunately, the contact between employers in large industries and their employees was gradually lost, so that it was necessary that a middle-man be developed who would take over the responsibility formerly carried by the employer. From this it will be seen that the contact between employer and the physician developed by force of necessity, and that the employer sought the physician rather than the physician seeking the employer.

Unfortunately, contact between employers in large industries and medical societies in the United States has never been developed. I believe industrial medicine in the United States would be in a better position to-day if contact between the employer and the local medical societies had been made at a very early date. The advantage, had such a contact taken place, would be that the employer would be able to get men who were more fitted for practicing in their factories than they sometimes have been able to procure, and, as you will see, only a particular type of training fits a man for the practice of industrial medicine. The physician in industry must have a good grounding in general medicine, must be a good surgeon, having had operating room experience in a first-class hospital and must also have a general knowledge of public health problems. In addition to this he should be the type of man who cooperates with others, and who is willing to sink his own personality in team work when such action is needed. He must know the factory in which he works. He must know manufacturing processes. He must know the working conditions of every job in that factory. He must know the man at his work, even to the position he takes at his machine.

As regards cooperation, the average doctor is not used to working in this way though many of us learned it during our experience in the army. In industry, the doctor must learn to work with a great many different people. As he is naturally an individualist it is rather difficult for him to fit himself into this new position. Just as he is used to people doing things for him, he must learn to do things for them. An instance of this cooperation appears in the physical examination of employees. The employment department passes on to the medical department the men whom they have hired. That means contact between the employment department and the medical department.

Each of these two departments has a problem. The employment department has this problem before it. It is hiring a certain number of men for the company whom it wishes to put to work at the earliest possible moment, and these men who are hired wish to be put to work as soon as possible in order that they may begin earning. If the medical department keeps these men waiting for their examination, vexation on the part of the employment department and on the part of the employee results. If the physician has all his arrangements made so that little time is lost in examining a man, both the employment department and the man examined reacts favourably. The amount of time lost to the individual and to the industry in such a case is probably ten minutes. The physical examination of applicants for positions in any factory is conducted with great rapidity, but is fairly accurate as we note by subsequent check-ups. We do not endeavour to make a complete analysis of every defect found, but send for the employee at a later date for this analysis. We do, however, expect to detect any defect which would render the employee a danger to himself, to others, or to property.

The industrial physician has to have contacts with the engineering department and with many other departments. Because of his responsibility for the health and safety of the employees in the plant, he should be subordinate to no other individual than a man holding the highest position. Unless he has the sympathetic understanding of the head of the factory, his influence will be weakened and his ability to spread his work throughout the organization will be materially diminished.

One of the important branches of industrial medicine is prevention. A great deal is being accomplished in this, but the opportunities for further advances are still great. In surgery, for instance, we have definite information as to our ability to control infection in industrial wounds. Although there are no statistics referrable to the United States as a whole, at the Norton Company I have analyzed 2,500 cases of accidents that were severe enough to be reported to the safety engineer and in which it was possible for infection to occur. In these we find that we

have had eight cases of infection, but of these eight cases we find there was not one who applied to the medical department within twenty-four hours of the occurrence of the accident, or who did not interfere with his dressing some time subsequent to the injury. In other words, we feel that the opportunity for infection is very slight if any indiviual applies to the company dispensary within an hour from the time of the injury.

In order to check up our experience with that of other companies, I wrote to a number of industrial surgeons and found, on compiling their answers, that out of 215,000 accidents there had been only 189 infections. This is a very extraordinary showing, but I am sure the figures are reliable as they are sent by surgeons who keep very accurate statistics. I think we are therefore safe in saying that infection following injury has been greatly reduced in those factories having adequate medical service.

Another thing in surgery which has been greatly improved by the industrial physician is the result obtained in fractures. Immediate diagnosis, immediate reduction with proper splinting, control and check by x-rays have done a great deal to reduce deformity and disability caused by accidents.

In orthopedic conditions, appearing among the employees, early treatment can be instituted. The industrial physician frequently sees cases long before they naturally go to their family or other physician, and by change of work and proper adjustment, supports, etc., a bad postural disease may be corrected or a beginning disease checked.

Considering medical conditions, it is obvious that the industrial physician can prevent the spread of contagious diseases. However, contagious disease is rare in industry with the exception of tuberculosis and syphilis, which are common and have to be watched for. An occasional epidemic of mumps, or measles, is usually all that is encountered. When tuberculosis is found, the worker should leave the industry immediately, but when the disease has been arrested, there is no reason why he should not return to work provided the working conditions are suitable.

The greatest problem in industry at the present time is acute respiratory disease, particularly of the upper respiratory tract. Forty per cent of all cases of sickness applying to the factory dispensary of a large rubber company have disease of the respiratory organs, and this figure, I think, would hold true in almost every industry. Cardiac disease constitutes about 2 per cent of all the sickness in industry. The actual figure at the Norton Company is 1.93 per cent. Dublin of the Metropolitan Life Insurance Company gives his figure as 2 per cent. A great many men have cardiac disease and are able to work for many years without discomfort if they are kept under medical supervision.

One of the things which has as yet not been developed to any great extent is the possibility of follow-up work and of research work among industrial workers. Most doctors do not realize the opportunity there is to watch men who have chronic disease, or physical defects, over long periods of time. A very large percentage of men remain in the same factory and you have the opportunity of studying these men at any time you wish. We can check up fractures, hernias, cardiac disease, or any other condition, at any time we want and over as long a period as we consider necessary. Then, in addition, there is a possibility of studying early disease. Doctor Mackenzie of England has written about this. I regret to say that most physicians in industry are so busy they have not the opportunity to do the investigating work which they should. It would be extremely interesting to see what a group of medical students, under the control of an instructor in medicine in a large medical school, could do in the way of research work on beginning disease in a large factory. I have always wished it were possible that a teaching institution could make use of factory dispensaries, as it does of the hospital clinics.

Last of all, I wish to speak about the industrial physician in the community. I believe the industrial physician can have a great influence in the community. I believe that the employer is very much a human being, and that very much better than legislation would be the effect on him of a doctor going to him and telling him that a great many cases of tuberculosis existed in his factory, and from what he knew of the working conditions, he believed it was due to unsanitary surroundings and close crowding. I believe an employer who once realized that there was an unhealthy condition existing in his factory would repair it as readily as he would a damaged

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machine, but unless the matter is brought to his attention by the medical man he is apt to be ignorant of the facts.

What I have been desirous of bringing before you to-day is a picture of industrial medicine and giving you an idea of the responsibility of the industrial physician to medicine, the factory and the community at large.

THE PHYSICIAN IN INDUSTRY

Report of a Sub-Committee of the Committee on Industrial Medicine, Ontario Medical Association*

By W. L. T. Addison

Toronto

THE huge costs at present paid by the industries of this province ($6,200,000 in 1923, 327 lives, 2,900 temporary disabilities and 2,340 permanent disabilities), as compensation to employees for industrial accidents, infections in minor injuries, and poisonings, represent a very heavy drain upon the financial resources of the industry. Employers are rapidly realizing that this drain must be decreased. The cost which is most apparent to the employer is that from accidents, and infections from small injuries (which cost $1,000,000 in 1923, and 15 lives, 14 amputations and 18 stiff joints). *But the loss of time and health due to general sickness amongst employees is much greater even than this.* This is expensive for the employer, but much more so for the employee, as the loss of time from sickness, which may fairly be estimated as equivalent to eight days per annum per employee is not compensated, and the loss falls on the employee and his family alone. The employer however suffers from the disorganization produced by the absence of employees.

At present, the usual practice in this province is to employ one of a number of different physicians to treat employees, who are injured or suffer from an industrial disease. In this case the responsibility of the physician is solely to the employee whom he endeavors to restore to his former state of well being. The physician has no duty to the industry as such, though the industry pays him for his services. Industry will demand, and is in the United States demanding, that physicians should serve industry by co-operating in reducing the incidence of accidents, intoxications and industrial infections. This involves a much more definite arrangement between the physician and the industry than is at present general with us in this province. The physician employed by industry must in view of the interests of the employer adopt the attitude that he has a duty to the industry as well as to the employee and that his first and chief duty lies in prevention rather than in cure, though he must endeavour to return his employee-patient to the plant at the earliest possible date, either completely cured so that he is able to resume his former work, or sufficiently alleviated that he can for a time carry on work lighter than normal and yet receive a full wage. This is most important if one has regard to the morale of the employee. Nothing increases his self-respect so much as his being able to continue at work, and it also does much to prevent his malingering unconsciously. In the case of sickness arising from toxication by poisons or accident or general illness arising in the plant, such as incapacitates the employee from remaining at work, the plant physician should refer him to his family physician or hospital for treatment, but in this case he must arrive at an arrangement with the family physician or hospital so that he is either able personally, or through his nurse, or by mail to receive reports as to the patient's progress and the likelihood of his returning to duty. This is absolutely essential in the interests of the employer who pays the compensation, and who will be paying the physician who is treating the case, or the hospital for the expenses incurred; the employer therefore is en-

* Presented at the Annual Meeting of the Committee on Industrial Medicine O. M. A. Dec. 9, 1925.

titled to see that these expenses are kept down as much as possible. The position of an employer resembles that of the commanding officer in a unit whose interest is that the unit shall be kept up to full strength. The industrial physician must become the regimental medical officer, and exercise some of the care that in the war was done in corps rest stations or by field ambulances. His duty is not to attempt the later work of a major type that was done in the field ambulance or in the casualty clearing station, though in large plants with a full staff this may be provided for. The physician in industry must also realize that his work as a teacher of preventive medicine is most important. This duty of carrying on the health education of the worker, is one that falls to no other physician dealing with adults.

It is the purpose of this report to point out the way in which the sub-committee believes that these huge losses can best be avoided. The sub-committee believes that the situation can only be met by each plant employing a single physician on either full or part time, whose chief duty will be to decrease losses. It is not sufficiently realized by the medical profession that the only possibility of certainly decreasing the cost of industrial disease and accident lies in prevention. It is true that inefficient treatment may greatly prolong the period of compensation in the case of industrial accidents or illness. The employer pays the costs and he is entitled to demand that the incidence of his losses be decreased as far as possible, but no employer will stand having six or seven different physicians continually inspecting his plant and his workmen to discover the source of accident or illness. Such an arrangement only needs to be suggested to make its futility clear. Consequently in the interest of the employer, one physician alone should be employed for the purpose of prevention and this physician if interested and thoughtful, inevitably becomes an expert in the possible hazards of the industry, and in the methods by which they can be prevented. He also acquires an expert knowledge of the treatment of the minor injuries, infections, and intoxications peculiar to his particular industry which no general practitioner can hope to acquire. This expert knowledge is of the greatest value both to employer and employee. Such a plant physician may be on full- or part-time, and assisted by a nurse or not, all depending upon the size of the plant and the character of the employment. The committee is familiar with the work of a physician, who only spends a few hours weekly at a certain plant, and yet by measures of prevention and properly supervised first aid, compensation claims have been greatly reduced. This can be done in every plant.

It has been the experience in all plants which have adopted a plan such as outlined in this report that it brings about a great decrease in the cost of compensation, and in the number of permanent disabilities, and the amount of time lost due to illness or infection. The medical profession takes pride in the altruistic work that it has done in prevention. Nor should the employment of a full- or part-time physician in any plant make any appreciable difference in the amount of work available for the ordinary practitioner, though it would doubtless lead to a redistribution of the work. It would indeed increase the total amount of work done by the medical profession as a whole, because the plant physician would be undertaking duties which at present are not performed by the medical profession at all, but by lay persons or nurses. One of the chief duties of a plant physician is the education in hygiene that he will inevitably diffuse and the effort that he must make to force the employees to realize the absolute necessity of prompt medical attention to even minor ailments. The plant physician will have the duty, arising out of his relation to employee and employer, of seeing that all cases referred to physicians and to hospitals are placed under the care of proper persons. While in most cases the patient's own physician will be capable of caring for the patient, there are certain types of accidents such as injury to the eye, where it must be in the interest both of employee and employer that he should be sent direct to a specialist. In other words, he will fill the functions of an admitting officer to a large hospital, in part at all events. Industry is the one place where the physician and adult worker can be brought most intimately into contact, and where the physician has the greatest opportunity of preaching the doctrine of early and careful attention to bodily health.

Such a plant physician will inevitably see

cases of general illness occurring in employees who come to the plant. These, in the interest of the employer, should be considered carefully, and the sick employee should be referred promptly to his own family physician, who will furnish, as specified above, information to the plant physician in regard to the rate of recovery of the patient. The plant physician as he gets to know the employees should be in a position to foresee the incidence of disease in the employees, either of a special industrial type, or due to physical conditions, and can therefore do much by his efforts to prevent incapacitating illness. Experience has also shown that if such a physician has the confidence of the employees he will often be asked for medical advice in regard to the families of employees, and he should realize that he has a duty in seeing that such illnesses are referred promptly to the family physician, as in this way alone will the employee be kept from worrying, and be able to carry on efficiently while at his work.

When it is realized that a case of illness or accident which is apparently recovered from, usually leaves traces which lower the norm of the individual, it is evident that by prevention alone can the greatest good be affected.

The committee would therefore recommend that the following summarized statement of the aims and objects of a physician to an industry in relation to his duties and responsibilities to employer and employee, be used by any physician who is undertaking a full time or part time position in any industry, as a basis for his arrangement with the employer, and the committee would point out that physicians now employed in industry might well make use of the same to strengthen their position and enable them to do better work.

The Duties and Responsibilities of a Works' Physician to Employee and Employer

1. He should treat or have treated all accidents, wounds, or intoxications occurring during employment and return the patients at as early a date as possible to full or useful employment.
2. He should give relief to all cases of general sickness not already attended, occurring in the plant, as long as the man continues at his work; if not at work, the patient should be referred to his regular physician.
3. He should endeavour to decrease the incidence of all infectious diseases occurring amongst employees of the plant, insisting on the isolation of such; (sending home persons with temperatures, or infections), and by the use of prophylactic measures and preventive education he should strive to decrease the incidence of infection arising in wounds. By these measures he will keep the maximum number of employees at work.
4. Arising out of the above the physician should
   (a) be familiar with the sources of accidents, wounds, intoxications, infections in wounds, and the sources and distribution of infectious diseases.
   (b) he should have the right, and exercise the right, to inspect and advise in regard to sources of accidents, e.g., lack of guards on machines, power lines, elevators, fumes, dust, etc.
   (c) he should have the right to recommend changes in the staff of employees if they are careless and thus tend to increase the hazards of other employees (especially foremen), or if they are dirty or careless in habits and be a source of infection to others.
   (d) he should examine employees exposed to intoxications and as a result of his examination determine the advisability from the viewpoints of employer and employee of the workman carrying on at his present job.
   (e) he should examine all applicants for employment to determine whether they are physically defective or liable to break down under the conditions of their probable employment, i.e., physical examination, in some cases psychological examination, i.e., for alertness, manual dexterity, etc. This is important as it enables certain easily detected disabilities to be discovered, even in a superficial examination, such as hernias, bad hearts, and bronchitic conditions; further, the works' physician has the opportunity of taking the first steps in educating the employee to come to him with what

he might consider relatively trivial complaints, colds, minor cuts, etc.

(f) he should carry out such periodical examinations of the employees as may be necessary.

5. In order to show that results are being obtained and to discover sources of accidents and infections, he should keep some system of records.
6. He should be responsible for all emergency appliances, dressings, first aid kit, masks, etc., and furnish a report from time to time that the same are complete and effective.
7. He should inspect all sanitary arrangements, urinals and water closets, washrooms, clothing and changing rooms, etc. Inspection should also be made of all feeding arrangements.
8. The physician should endeavour to supply health education in regard to minor points, which should include systematic talks on first aid and prevention of accidents, intoxications, infections and disease. The danger of infected persons or infected wounds should be constantly instilled into the employee.
9. The physician should understand that it falls within his province, just as is the case with a medical officer in the army, to protect the employee against pressure being brought to bear on him to continue at his work when in the opinion of the physician he would be likely to suffer from the same or would be a danger to other employees.
10. The physician should report directly, at definite intervals, on all matters which come under his survey, to the general manager of the plant and should have the right to discuss with him all difficulties arising out of his work. He should further be assured of the support of such a manager if he is to achieve success.

BRIEFLY DRAWN DIAGNOSTIC PICTURES OF INDUSTRIAL INTOXICATION BY LEAD, BENZOL AND NICKEL*

By Norman Gwyn, M.D.

Toronto

POISONING BY LEAD.—Even in the absence of the typical symptoms, (colic, blue line, anæmia, paralysis, encephalitis, kidney disease and arterioclerosis), an indisposed worker should be carefully examined for signs of lead absorption if he is engaged in any one of the following pursuits necessitating the use of lead in any form: lead mining or smelting, lead roasting, making of white lead, lead burning, the handling of lead or its salts, making storage batteries, the making of pottery; the manufacturing of rubber articles, the enamelling of toilets, sinks, and baths of all kinds, painting, glazing, printing, stencilling, brass working, bearing-metal manufacture, the making of babbitt metal; sandpapering of paint, paint chipping; soldering, plumbing, shot making, the making of can or car seals, silver foil making; lead tempering of wires, wire cloth, piano wires and magnetos; making linoleums, glass polishing, in short, every occupation involving use of lead in any form. The examiner should make a critical enquiry as to the details of an occupation. A worker who says he is employed as a hand in an oil refinery may be engaged in burning or handling lead pipes; a "gas-works man" may be employed in soldering or wiping joints. There are frequently unsuspected hazards.

Workers subjected to the risk of absorbing, ingesting, or inhaling lead, its salts, and its fumes, may show the following large range of symptoms and signs long before the typical picture of intoxication has developed, and such symptoms suggest that lead is being absorbed. 1. Loss of strength and weight, nervousness. 2. Failing vision, double vision, specks in field of vision, itching of eyelids. 3. Ringing in ears, deafness. 4. Nausea, anorexia, sweet or bad taste, bad breath, salivation, constipation,

* Report of the Sub-Committee, presented at the Annual Symposium of the Committe on Industrial Medicine, O. M. A., Dec. 9, 1925.

distension, diarrhœa, visceralgia, mild colic, vomiting, diseased gums. 5. Urine incontinence, or frequency; impotence. 6. Palpitations, nose-bleeds. 7. Neuralgias, weakness in legs, arthritic pains, anæsthesias, paræsthesias, rheumatism; cramps in muscles, tremors, a fixed and drawn expression. 8. Headache, vertigo, syncope, insomnia, nightmares, depressions, confusion, failing memory, excitability.

Careful examination for a blue line, for stippled red cells in the blood, and for traces of lead in the urine or fæces is essential in the face of such premonitory symptoms.

Continued exposure may result in severe colic, an extreme degree of constipation, vomiting, wasting and anæmia, blindness, deafness, paralysis of feet, hands or other muscles, intense headache, delirium, hallucinations, convulsions, apoplexy, insanity and death. If the nervous system is less actively attacked there may be seen arterial degeneration, hypertension, cardiac enlargement and renal sclerosis. It is generally agreed that early colic may be a saving grace by removing the victim from the chance of further exposure; it may however be that the nervous system of some workers is more vulnerable than that of others.

In the lead workers who may be showing such symptoms as just described, it is likely that there will be in evidence:—wasting, sallowness, yellow pallor and anæmia with stippled red cells, bad breath, swollen gums, a blue line on the gums, a coated tongue, firm arteries, albuminuria, and an enlarged heart. If the patient be seen in an attack of colic the rigidity and concavity of the abdominal wall may be striking. The absence of distension and fever in an acute abdominal condition is a noteworthy detail of the picture of lead poisoning. The blood pressure may be raised at the time of the intestinal cramp. Paralysis of eye muscles, encephalopathies, foot-drop, wrist-drop, and wasting with impaired power of other much used muscles is more apt to be seen in the type of case that has escaped abdominal symptoms.

In the very acute and pronounced cases showing colic, constipation, anæmia, paralysis, and perhaps encephalopathy, with blue line stippled cells and a very evident history of exposure, there is usually no difficulty in determining the nature of the disorder. Milder degrees of intoxication require for their detection and explanation an exact appreciation of the nature of a man's work, a knowledge of the fact that lead is stored in the bones and may remain there till conditions of ill health or an acidosis may call it forth, and finally a recognition of the existence of the host of minor but incapacitating symptoms. Of great assistance in the diagnosis of lead poisoning will always be the blood examination because work in lead, ill health and stippled cells, is a triad which has often provoked correct suspicions. The examination of the urine for lead must remain as a final determining proof of lead absorption; lead in the fæces may only indicate lead ingestion. It may, however, induce a tentative diagnosis of plumbism. As regards the presence of lead in either fæces or urine, one would say of it as of the blood findings, that in the presence of symptoms it is valuable to a degree. The intricate chemistry of these tests for lead in the excreta makes them not too readily available, but they are well described in Hutton's comprehensive compilation.

Benzol poisoning.—The following are some practical points with reference to the diagnosis of benzol poisoning. Benzol is widely used as a solvent, a vehicle, or as a motor fuel. As a solvent it it used in the rubber works, in the manufacture of artificial leather, in the manufacture of certain paints, floor waxes, varnish removers, and certain kinds of cement.

In a worker exposed to the fumes of benzol and presenting signs and symptoms resembling purpura hæmorrhagica or pernicious anæmia, benzol poisoning must be thought of. The diagnosis depends upon: 1. A history of exposure to the fumes of benzol. 2. A history of failing strength, drowsiness, anorexia and vomiting, with mental depression, pallor, breathlessness, and perhaps dizziness:—a statement that there is a tendency to hæmorrhage, to easy and unexplained bruising, to bleeding from the nose and gums, to excessive flow at the menstrual periods in the case of women:—the information perhaps that a man has shown maniacal symptoms or seems mentally unbalanced. 3. The facts that the examination shows a pallid, weakened man with signs of recent or old hæmorrhages, with a low blood count, a low hæmoglobin and low white cell count with other signs of anæmia such as poikilocytosis

and variations in the size of the red cells to both above and below normal.

Further details in connection with this interesting toxic anæmia are that the coagulability of the blood is reduced, that the platelets seem to be almost absent, that there is a lymphocytosis, that there is a variation in the staining of the red cells, and that nucleated red cells are practically not seen.

As for the outcome, one may say that with removal from the exposure the worker will slowly recover even from an attack which has brought his cells down to 600,000 per c.cm. In the milder cases the recovery is more rapid as regards the red cells; the white cells require a longer period to regain their normal level.

The condition resembles somewhat aplastic pernicious anæmia. It can be distinguished by the history of exposure to benzol inhalation and by the fact that the patients recover from the severe anæmia when the exposure is discontinued, unless they have sunk too low. In pernicious anæmia the blood films show more of a tendency to variation above the normal size of red cell, while in benzol poisoning the variation is to both above and below the normal size; the absence of, or the scantiness of normoblasts in the blood of benzol poisoning is always noteworthy.

A remarkable case, for the notes of which I am indebted to the service of Professor Graham at the Toronto General Hospital, was that of a man who had worked for ten months as a japanner in a paint factory. He noted weakness at the end of two months. By the end of six months he was suffering from dyspnœa and dizziness. Bleeding occurred from the gums, from the kidneys and into the retinæ, the skin and mucous membranes. His blood went down to as low as 600,000 red blood corpuscles and 1,200 white cells. The hæmoglobin touched twenty per cent. There were no platelets and no nucleated red cells in evidence in the smear and the blood required fourteen minutes to coagulate. Active treatment with transfusions saved his life and in a year his blood was restored to its normal condition.

Nickel poisoning.—A rash is liable to appear on the skin of men working in nickel refining or in nickel plating. It is most apt to develop in hot weather; seldom in the winter. The rash first appears on exposed surfaces or where any point or irritation exists as may arise from stiff collars or cuffs, or in the folds of the skin at the joints, etc. The rash is characterized by an intense itching, worse at night this itching is followed in a short time by the appearance of a papular pinpoint rash which may later become wet and eczematous, or may be eczematous from the first. From a small beginning, the rash is apt to spread rapidly to neighbouring areas on the skin.

"The clinician of the future is to be a professional man and not a tradesman. He will see in his patients human beings whose distress appeals to his heart and not alone to his commercial instincts, his scientific or technical skill and pride. He will be well educated as to knowledge and methods. He will have the wisdom to use this knowledge in practice with a due sense of proportion of the value in the recognition of disease, of history, observation and instrumental and laboratory examinations. He will not pretend to know all or to do all as rightly could our practitioners of fifty or seventy-five years ago. He himself will do much less than they did. He will recognize his own limitations and appeal oftener to the expert. Between him and the expert there will be the cordial relation of colleagues and not the antagonism of rivals for trade-gain or reputation. He will be no second rate product of our medical schools, but one of first rank. He will be practical but inspired to ever improving work by the spirit of investigation. While clinging fast to that which is good of the old he will be no slave to tradition, but will be able to throw aside the disproved old for the proved new. He will be, and will be regarded as being, a scientific man. He will become the family confident as of yore, the family adviser, well recompensed for his services."—J. B. Herrick, *J. A. M. A.*, Jan. 2, 1926.

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NOTIFICATION OF OCCUPATIONAL DISEASES*

By O. A. Cannon, M.B., F.A.C.S.

Hamilton

A YEAR ago, Dr. Riddell in his excellent paper showed us that occupational diseases were widespread in this province, that physicians were not alive to their importance and urged that some method be devised to secure reports of these diseases. A small committee was subsequently appointed to report to this meeting on the advisability of instituting some system of compulsory notification of diseases resulting from industrial processes and to make some recommendation as to the method to be adopted.

Dr. Riddell reported in his paper that up to that time some 350 cases had been brought to notice. Eighteen diseases made up this number. Since the meeting of last year the Division of Industrial Hygiene of the Provincial Department of Health found in its surveys and from the reports made, an additional hundred cases. Although the reports received are from all sections of the province, a comparatively small proportion of the industries operating in the province have received attention, and only a few of the large number of physicians attending men engaged in industry have reported cases to the department. It is certain, therefore, that very many cases of these diseases are not reported and not recognized. There is sufficient evidence to show that they occur throughout the province, that nearly all industries have their special occupational hazard and that the problem of controlling these is worthy of our best effort and that more energetic methods must now be put in operation.

Being convinced of the importance of these maladies, the next point to establish is that they can be brought under control and often entirely eliminated from industry. Dr. Lee K. Frankel classes industrial hygiene as one of the major branches of the field of preventive medicine. The striking instance cited is the great reduction in the incidence of lead poisoning after the chemistry of lead and the manner in which it is carried to the exposed workman had been studied.

The Metropolitan Life Insurance Company found among its industrial policy-holders in 1911 a death rate from lead poisoning of 6.4 per million and in 1923 this loss had been reduced to 3.9 per million, a reduction of 39 per cent, even though during this period there was an enormous increase in the use of lead in industry, especially in the making of rubber tires, painting automobiles and in the manufacture of storage batteries. In the Pullman Car Company, where there were seventy-seven cases of lead poisoning in one year the introduction of supervised washing of the hands enabled the company to report no cases the following year. A Paris green factory in London lost through sickness due to arsenic dust, twenty-five men a year. For four years, since the installation of suitable apparatus to take care of the dust, no cases have occurred. Instances could be multiplied, but one taken from Dr. Cunningham's report for 1924 shows what is being done even in our midst. In a plant in Port Colborne the introduction of simple methods has reduced to one-eighth the number of cases of nickel rash appearing. It is doubtful if there is any occupational disease which would not yield to a knowledge of the manufacturing process, the chemistry of the substances and the effects of these substances on the human organism. Dr. Riddell urged this as a necessary knowledge last year, but the doctor who meets the occasional case cannot be expected to be familiar with these matters. If, however, all would pool their knowledge by reporting these cases as they occur, the doctor would have the counsel of those who are studying the subject over a wide field and who could then give advice as to diagnosis and treatment. Dr. Lee K. Frankel in an article recently written on, "The Control and Elimination of Industrial Diseases," makes use of these words: "It seems possible that when the scattered elements of the industrial hygiene movement are brought together

* Report of the Sub-Committee presented at the annual symposium of the Committee on Industrial Medicine, O. M. A., Dec. 9, 1925.

and when the reporting of industrial disease and the consequent mortality is placed upon a reasonably sound basis, then specific lines of action will be developed which will shortly result in the practical extinction of the sickness and mortality arising from this cause."

Reporting of infectious cases to authority was done in the first instance, in order that the sick person could be so disposed of, that he would be unable to communicate his disease to others. It applied at first only to those diseases which were manifestly contagious and dangerous, such as small-pox, etc. Later as the knowledge of the cause of the various diseases were better known, health authorities, in addition to isolating the patient, instituted a search for the source of infection in order that other persons would not be attacked from this same source. In a similar way the report to a local medical officer of health that a case of industrial disease had occurred in a workman employed in a certain industry would be a signal for an investigation at that industry with the object of preventing other workmen from being affected by the same condition. This investigation properly done and with the advice of the experts of the provincial department could not help but be of great benefit in the prevention of further instances of the disease.

We are now required to report venereal disease by number, the object of this legislation being to acquaint the authorities with the prevalence of the disease and of the localities in which it occurs. Goitre is another disease reportable in this province and as no action is taken in the individual cases the object is to determine the prevalence of goitre, the localities in which it is found, the forms it assumes, in order that after a study of the statistics steps may be taken to assist the population in the affected districts to combat the disease. In a similar way the compulsory notification of industrial diseases would create valuable statistics for the study of these diseases. To quote Dr. Frankel's paper again: "There seems to be a distinct need for a uniform plan of reporting industrial diseases and for the succinct statement and publication of the facts reported. Statistics thus compiled would act not only as the indicators of the extent of the problem at the present time but would establish bench marks against which the progress of the future may be measured."

Members of the committee state that they meet conditions in industry which they believe to be due to the processes carried out there but which they are unable to diagnose. Dr. Riddell referred last year to the indefinite clinical picture of some of these conditions. Dr. Cunningham in his report for 1924 observes that from ignorance of the symptoms and signs of industrial diseases, many are escaping attention. Indeed all authorities agree that some of these diseases occurring rarely and as yet little studied, present serious difficulty in diagnosis. Then again manufacturing processes are continually changing, new products being turned out and new methods being devised in the production of old ones and all these with new hazards to the workman. We have therefore to deal not only with the industrial hazards which are already recognized but to provide facilities for the detection and prevention of the new hazards which arise in the course of industrial development. If, however, all cases were reported to a central authority with the clinical signs and symptoms there would soon be piled up for analysis a volume of experience which would be of great value in the diagnosis, treatment and prevention of these diseases. Some of us are already learning to rely on the Division of Industrial Hygiene for assistance in some of these obscure cases.

The Workmen's Compensation Board pays compensation and medical aid in a certain definite number of occupational diseases. The board has shown a disposition to add others to the list as soon as the signs and symptoms are such that the condition can be definitely diagnosed and the exposure to the intoxication shown. By reporting these cases definite diagnostic indications could be established and additions made to the list of diseases now compensatory under the Workmen's Compensation Act.

Let us see for a moment what is being done elsewhere. None of the Canadian provinces require notification. England requires physicians to report five diseases to the Factory Inspection Department of the Home Office. A fee of 2/6 is paid for each report. Australia and New Zealand have no law on the subject.

In the United States of America, twenty-six states require the reporting of diseases, the list of which varies in each state. Some report to

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the department of health, some to the department of labour, some to the Workmen's Compensation Body, and some to more than one of these. Dr. Hayhurst of the Department of Health of Ohio, which state has the most complete legislation in this regard, complains that the law is not being observed and that it was necessary to get out a circular advising the practitioners of their duty, and reminding them of the penalties attached. The reports have since been trebled. Illinois required employers of labour to report. Dr. Cofer of the Department of Labour of the State of New York makes the following significant observations in a letter to Dr. Cunningham: "The law is not being complied with in a satisfactory manner by any means. There are several factors at work back of this. One is that physicians as a class are neglectful when it comes to filling out forms of various kinds. Then again physicians as a rule are not very familiar with occupational diseases as such. The end result is that at the end of each year the number of cases reported is relatively small and indicates in a very limited degree the actual status of the diseases of this class. The only remedy I see is education; that is to say, if the actual industrial history of each patient is recorded in the clinical histories, by degrees the profession would begin to link up the relationship of certain symptoms with an occupation and then, perhaps, they would be gradually reminded to report occupational diseases just as births and deaths are reported. I believe the most important recourse leading to the reporting of occupational diseases is to first get the disease on the statute books so that persons who suffer from it will be allowed compensation. Then in due course of time the medical profession as a class will begin to study these diseases on account of their connection with them from a compensation standpoint." Your committee does not agree that things are as hopeless as Dr. Cofer makes out, but like him we believe in the education of the physician along these lines and we believe that the best way to educate him is to have him report his cases of industrial diseases and thus contribute his share to the general knowledge. One good point he makes is that the industrial history should be recorded with his clinical history in order that the connection may be noted. Dr. Cofer asks for compensation first and notification after; the cart before the horse. Is it not better to have the notification first in order that compensation may be secured by establishing a case for a given disease?

The suggestion is therefore put forward that an approach be made to the proper authority to have provision made in the Public Health Act somewhat as follows: "Every medical practitioner attending on or called in to visit a patient whom he believes to be suffering from anthrax, lead poisoning, mercurial poisoning, phosphorus poisoning, arsenical poisoning, ankylostomiasis, miner's phthisis, benzol poisoning, silicosis, or any other disease which the medical practitioner believes to be due to the occupation in which the patient is engaged, shall immediately give notice on the form provided to the medical officer of health of the municipality in which the patient is employed." The form suggested should give the name, age, address, where employed, full duties of his occupation, and the details of the signs and symptoms shown. The medical officer of health is the official to whom we are accustomed to send reports; he has a staff of inspectors, he reports regularly to the provincial department and is the local authority who deals with any condition which is a menace to health and is the logical one to receive the reports. The practice of listing certain diseases and stopping there is not to be recommended. It closes the door to conditions not listed and would defeat the purpose for which notification is desirable, viz., the study of the indefinite conditions. Therefore the clause should be so framed that even those industrial sicknesses to which the doctor cannot assign a name would nevertheless be reported.

Payment for these reports is not recommended at present as they are in no way different from other reports required under Provincial Statutes and for which the physician has not been paid. It would be expected that the Provincial Department of Health would regularly supply the practitioners of the province with bulletins giving the information which it has been possible to compile from these reports.

THE HANDICAPPED SURGICAL PATIENT. I. THE DIABETIC PATIENT

By F.N.G. Starr, C.B.E., M.B., F.A.C.S., F.R.G.S.,

And

A. G. Fletcher, M.B., (Tor.)

THE SERVICE rendered to the handicapped surgical patient by the work of that great Canadian, Frederick Banting, can never be measured in words, nor can the gratitude of the diabetic ever be sufficiently expressed.

The diabetic patient is remarkably liable to the development of complications, many of which require surgical treatment. In the past he has been considered a bad surgical risk. As a result of the disordered metabolism the tissues do not heal readily, and at the same time lend themselves more easily to infection. Operative procedure and the anæsthetic both aggravate the diabetic state and may convert a mild case into one of coma. With adequate preoperative and postoperative treatment carried out under insulin administration, these dangers can, to a large extent, be avoided. It is perhaps still true that from a statistical standpoint the diabetic is a poor surgical risk. A large group of diabetics are well on in years and, besides this, they show premature degenerative changes, especially arteriosclerosis and myocardial disease. Exclude this type of case and it may be said that, under careful control, diabetes does not materially increase operative mortality.

In the preparation of the diabetic patient for operation, various disturbances of metabolism are to be considered: hyperglycæmia, dehydration, ketosis, acidosis, under-nutrition, and depletion of the carbohydrate stores. Any of these disturbances may be present to a degree which, if not relieved, may seriously endanger the patient during operation.

The importance of a normal blood sugar level is now generally recognized. It is desirable to allow several days when possible for the determination of the severity of the diabetes and the required amount of insulin to maintain a normal blood sugar level, while the patient is on a suitable diet. In emergency operations, however, this preparation cannot be carried out, but in such cases maximum amounts of insulin should be administered during the time that may be available before operation, for the purpose of reducing the blood sugar level. In this way the liability to post-operative complications will be much reduced, and this is especially true with surgical infections, such as diabetic carbuncle, where reduction of blood sugar will lessen the danger of post-operative pyæmia or multiple abscess.

Where there has been much glycosuria it is likely that dehydration has taken place. This becomes early manifest in the increasing thirst of the patient, and later by the dry tongue and skin, and finally by the soft eye. It is to be remembered that such a patient may have lost more than five per cent of his body weight, and that three or four litres of fluid may be given for two or three days, whenever marked signs of dehydration are present.

Traces of acetone in the urine as shown by a weakly positive sodium nitro-prusside test may be neglected, but any well developed ketone intoxication should be actively treated by increased carbohydrate and insulin administration. Severe degrees of ketosis are unusual unless the case is one of infection, when the insulin requirement may be as much as fifty units every four hours, and glucose given in amounts necessary to control hypoglycæmia. As a rule, acidosis will clear up with the ketosis under insulin treatment. When marked, however, alkali may be given, but when this is done the amount of alkali given should be determined and controlled by carbon-dioxide combining power of the blood serum.

The nutrition of the patient and the diet require special consideration. Not only is it inadvisable to attempt reduction of sugar content by a course of undernutrition, but *under insulin administration it is possible to prescribe any diet which may be considered necessary to strengthen the debilitated patient.* This is especially the case

in preparing for operation patients with chronic cardio-vascular disease. In uncomplicated cases it is usual to supply a diet containing two-thirds to one gramme of protein per kilogram of body weight, and sufficient fat and carbohydrate to provide calories thirty per cent., above the basal caloric requirement. Carbohydrate should not be restricted too closely. It is the most readily available form of energy, and besides this, excess carbohydrate appears to be of value in protecting the liver during the course of the anæsthetic and operation. Thirty grammes of carbohydrate may be given over and above the usual amount calculated to prevent ketosis. Milder diabetics will tolerate this maintenance diet readily. Many cases, however, will require insulin, which should be administered in amounts adequate to lower the blood sugar level within the normal range. Twenty to forty grammes of glucose or other carbohydrate and fifteen units of insulin should be given two or three hours before operation.

Post-operative treatment should be carried out to anticipate the disturbances in metabolism as they develop. It is probable that any degree of operative interference aggravates the diabetic state, and further damage to the islets of Langerhans may result. Small doses of insulin, such as ten units three times a day, may be given as a matter of routine, as soon as food is taken. This dosage, however, should be based upon the determination of urinary sugar, and when possible that of the blood. In major operations some degree of hyperglycæmia is unavoidable, but insulin should be increased in an attempt to control the rising blood sugar level. When the patient is able to take food, a suitable diet is provided by milk and cream and, when tolerated, eggs, fish, fowl, meat, vegetables and fruits gradually added to a maintenance level. Fluids should be provided freely.

After operation ketosis may develop very rapidly and means must be taken to re-establish adequate carbohydrate utilization. When there is hyperglycæmia and glycosuria, increased doses of insulin may be sufficient for this purpose. Otherwise additional carbohydrate must be supplied. Post-operative nausea and vomiting may occur, aggravated by the ketone intoxication, and marked dehydration may set in. It may be necessary, therefore, to administer the glucose and fluid intravenously, giving 500 c.c of five per cent. solution as often as may be required. In the event of infection or severe toxæmia the insulin value may be markedly lowered and the patient may require even as much as fifty units, or more, four times a day. Under such conditions the insulin administration must be pushed until evidence of its effect is observed in the lowering of the blood sugar level and the control of the ketone intoxication.

What has been said about the diabetic surgical risk applies with equal force to the pregnant diabetic. The use of insulin has been advocated in the pernicious vomiting of pregnancy. This, however, does not seem to be necessary for, according to a recent study by Harding and Van Wyck, now in press, the ketonuria is the result of dehydration. They come to this conclusion: "Its use in skilful hands may be harmless, but we do not believe it to be a valuable adjuvant to treatment," and "The successful treatment of hyperemesis gravidarum depends on the use of fluids."

The Repaired Heart.—In the case reported by James L. Fisher, Youngstown, Ohio, the heart, in which a large laceration had been sutured, was called on in three weeks to endure the added strain of a severe bronchopneumonia. The heart behaved satisfactorily in every respect, with the exception of the rate. Although rapid, the pulse was at all times regular in time and the beats equal in volume. At the time of maximum lung involvement, the circulation was only moderately embarrassed. Digitalis in the dosage given exhibited but little effect in slowing the heart. It is assumed that the vagus stimulation was not sufficient to overbalance the increased irritability of the myocardium. The presence of nonabsorbable suture material would perhaps tend to prolong the irritability. *Jour. Am. Med. Ass.* Jan. 16, 1926.

THE HANDICAPPED SURGICAL PATIENT. II. DUE TO CARDIOVASCULAR DISEASE*

By Frank H. Lahey, F.A.C.S., and Burton E. Hamilton, M.D., Boston, Mass.

CARDIOVASCULAR disability, of course, includes in its great variety of disorders some conditions which require or suggest a specific treatment.

In the majority of cases, however, this disease is determined by a fixed end-result pathology not to be directly approached. Treatment is forced toward removing coincident burdens such as weight reduction in the obese, removal of evident foci of infection, and adjustment of habits, drugs, diet, hygiene, and living conditions. Adequate care of the patients demands an individual treatment based primarily on direct personal diagnosis.

We realize that our enumeration of these well-known therapeutic considerations may appear like platitudes; but we desire to avoid the impression that we overvalue the single important new point of view that our experience has brought us, that is, the removal in these cases of coincident surgical burdens. We wish to stress particularly the operability of these patients. They may be operated upon under certain conditions with surprisingly low mortality. Of 136 cases with serious rheumatic heart disease personally examined by us and followed through major surgical operations (partial thyroidectomies, abdominal section, and herniotomy), 6 died. The group includes a majority with mitral stenosis; a fair number with aortic regurgitation or with both of these lesions; 31 with auricular fibrillation, and 36 with clear evidence of decompensation. One death only occurred in 87 operative cases with severe rheumatic heart damage, but with neither auricular fibrillation nor failure. Of sixty-seven operative cases with hypertension, regular heart beat, and enlargement of the heart, secondary to the hypertension, one died. Four had had congestive heart failure; two had had persistent alternation of the heart beat; two had had hemiplegias. Of thirty-seven cases selected for gross enlargement of the heart, or auricular fibrillation or anginal or congestive failure (or combinations of some of these) attributable to cardiovascular sclerosis (obviously very poor cardiac risks), three died. A few cases of clinical cardiovascular lues have been operated upon without a death. A small group of twenty-two cases with probably congenital heart disease furnished four operative deaths and some unpleasant surprises. Of 150 cases with established auricular fibrillation (many of these with otherwise badly damaged hearts and with decompensation), there were six operative deaths. A group of more than 100 patients with gross congestive heart failure and thyroid toxicity have been operated upon with three deaths. In all the cases enumerated, the patients clearly had severe cardiovascular disease. No one could wish for them as surgical patients.

Study of the deaths in the whole group shows that those cases with severely damaged hearts, such as mitral stenosis, or aortic regurgitation, but without congestive failure or auricular fibrillation, had a negligible mortality (excepting the small group with suspected congenital heart disease.) The distinct impression left with us by most of the dangerous cases, those with failure, auricular fibrillation, or both, is that they have tolerated operative procedures surprisingly well. Most of this group did not have any actual choice of risk. They were disabled and with little chance for improvement. Removal of the apparently significant surgical burden was the only promising chance for improvement.

We wish to stress also the importance of searching such patients for surgically removable burdens. The patients with both thyroid toxicity and congestive heart failure first called our attention to the possibility of relieving cardiovascular disability in suitable cases by the surgical removal of a coincident burden. Cardiac capacity was restored strikingly by the removal of a surgical burden. In an occasional case of rheumatic heart disease without previous dis-

* Abstract of paper presented at Interstate Post-Graduate Assembly through courtesy of *Jour. Surg., Obst. & Gyn.*

ability, congestive heart failure has developed in the latter months of a pregnancy. The failure has persisted in spite of medical treatment until well after delivery with an unexpected satisfactory return of ability following. These cases have suggested to us the possibility that some other large coincident mechanical burden surgically removable may in occasional cardiovascular cripples be the determining factor in disability. Exclusive of the thyroid cases, and those with the burden of pregnancy, no single large group of complicating surgical burdens is to be expected among cardiovascular cripples. We have, however, a small but steadily growing group of patients suffering from cardiac disability who have been greatly improved by the removal of a coincident diseased gall bladder or a large pelvic tumour. The operability of patients with severe cardiovascular disease possibilities of indirect surgical treatment is not generally appreciated.

We wish, however, to emphasize the need of careful preparation of such cardiovascular patients for surgical treatment. We are not fatuous enough to believe that the severely disabled patient with cardiovascular disease is a good risk in routine surgery. These fragile patients deserve elaborate pre-operative care, and in spite of the most painstaking preparation, a definite number will die unexpectedly and suddenly. The first essential is an accurate diagnosis of the cardiovascular condition. We have as a routine used indirect methods of diagnosis, urinalysis, kidney function tests, blood chemistry, cell counts, blood pressure, examination of the eye grounds, and so forth. We believe these tests however, to be but adjuncts of clinical diagnosis and do not feel that they should be allowed to be the uncorrelated basis for determining operability of patients. We do not believe that any formula upon these indirect tests will adequately express operability. Study of the heart by graphic methods has its direct value as an aid to diagnosis, but does not occupy a prominent place in determining operability.

From our experience, nothing can supplant direct personal diagnosis and daily supervision in estimation and control of dangerous cardiovascular risks. Operating within three weeks of a congestive failure (even though of breif duration) is something to be avoided, if possible, from our experience. Though we have operated successfully in many cases when signs of congestive failure were still present and on a small number of patients who had chronic "failure of the anginal type," the time has been chosen only when prolonged medical care showed the patient to be at his best in terms not only of laboratory tests and of physical signs, but general welfare, as evidenced by the character of the respiration, sleep, and absence of anxiety. Though we have avoided routine digitalization, proper digitalization of patients with auricular fibrillation and associated rapid ventricular rate can be shown to reduce cardiovascular disability. Although routine electrocardiographic tracings will determine the condition in most but not all of these disorders, operable condition of the patient who has disorderly heart action only in attacks can be discovered solely by direct and continued observation.

In view of our low mortality in this type of case, we urge that patients of this group who have coincident and burdensome surgical lesions, after proper preparation and consideration by rest, and partial or complete restoration of compensation, may be operated upon and relieved of such lesions. It has been our experience that if there is co-operation between cardiologist, anæsthetist, and surgeon, not only will the mortality in this seemingly hopeless group be surprisingly low, but the degree of restored ability in many cardiovascular cases will be strikingly high.

Characteristic Changes in Blood Chemistry in Whooping Cough.—A total of 200 analyses of the blood in whooping cough have been made by Joseph C. Regan and Alexander V. Tolstoouhov, Brooklyn. Distinct and apparently significant changes have been encountered, the most characteristic of which were (1) a lowering of the hydrogen ion concentration of the blood and (2) a diminution of the inorganic phosphorus content.—*Jour. Am. Med. Ass.*, Jan. 16, 1926.

THE HANDICAPPED SURGICAL PATIENT. III. DUE TO BENIGN HYPERTROPHY OF THE PROSTATE*

By Waltman Walters, M.D.

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INCOMPLETE obstruction, whether in the stomach, intestine, common bile duct, or urinary tract, produces a toxæmia with the accumulation of non-protein nitrogen, such as urea, in the blood, due to an increase in the breakdown of the body proteins, or to its retention in the blood stream resulting from the failure of abnormally functioning kidneys to eliminate it. With the toxemia and accumulation of urea in the blood, the acid-alkali balance may be disturbed with resulting acidosis or alkalosis. These chemical changes in the blood caused by the obstruction, unless recognized and compensated for, may cause the death of the patient. Although the relief of the obstruction, whether it is biliary, intestinal or urinary, is essential to ultimate recovery, it should not be undertaken until the condition of the patient affords a reasonable assurance that an operation may be safely performed.

Methods of restoration.—The preparation of such patients for operation demands the correction of the function of the kidneys, liver and intestinal tract, and the control of infection. The neutralization, detoxication and elimination of the toxic products resulting from the obstruction, is essential. The necessity for maintaining a normal fluid balance in the body is apparent in every type of disease; water in sufficient amounts drunk by the patient allows an interchange of fluids between the body tissues and the blood. It is a solvent and diuretic and is of great value in the elimination of nitrogenous material such as urea and creatinin. The concentration of water in the blood stream affects the regulations of body temperature as shown by Barbour. A diminution of the fluid content of the blood causes a decrease in the oxygen carrying power of the red blood cells by reason of increased viscosity.

The intravenous injection of a 1 per cent. sodium chlorid solution, which has been used by Bumpus in the preoperative preparation of patients with benign hypertrophy of the prostate who are handicapped by disturbance of renal function, not only supplies the blood and tissues with fluids, but increases the number of chlorid molecules, which may have a detoxicating effect, as evidenced by the satisfactory control of toxæmia in other types of obstruction and stasis.

Sodium chlorid solution injected intravenously, usually suffices to control the toxæmia co-existing with prostatic obstruction. It is sometimes advantageous to add glucose, since it is quickly oxodized in the body, to produce heat and energy. This can be done by the continuous intravenous drip suggested by Matas, or by means of repeated injections of a 10 per cent. glucose and 1 per cent. sodium chlorid solution, which has been found by McVicar adequately to control the toxæmia resulting from gastro-intestinal stasis. Glucose too acts as a diuretic, and its value in the treatment of toxæmia resulting from biliary retention has been described by Judd and Burden.

Should acute retention of urine in the bladder occur, the necessity for withdrawing the urine gradually is apparent since its sudden removal may be sufficient to cause suppression of urine. The relation between the circulatory pressure and urinary pressure may be disturbed by alteration of either. The same principle applies in the relief of biliary obstruction. Crile has shown the advantages of slowly relieving the pressure in an obstructed biliary tract by allowing only a gradual escape of bile through the drainage tube. In biliary obstruction resulting from a malignant neoplasm at the head of the pancreas, anastomosis of the gallbladder and the intestine which permits only a gradual release of the obstruction, achieves results far superior to those obtained by external drainage

* Abstract of paper read before the Clinical Congress of the American College of Surgeons, Philadelphia, Pa., October, 1925. Reprinted from *Surgery, Gynecology and Obstetrics*, 1926, xlii, 191-194.

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such as cholecystostomy in which the pressure is quickly and suddenly relieved.

With the gradual relief of the obstruction, whether spontaneous or induced, improvement in the patient's general condition is at once apparent. It is a fact that operations performed on debilitated patients, in whom improvement has begun, are attended with as little risk as though complications had not appeared. The appearance of the patient and his opinion as to the condition of his health usually indicate when improvement begins. Also, the phenolsulphonephthalein test of Rowntree and Geraghty, and an estimation of the amount of urea in the blood, give accurate information concerning the functional capacity of the kidneys. Should the condition of the patient be such as to increase the risk of surgical procedure, then the usual methods of restoration suffice in most instances to prepare the patient for a safe operation.

Cabot has said that infection does not develop in a previously clean bladder following catheterization, until over-distension from urinary obstruction occurs. With prostatic obstruction the patient is usually unable to empty the bladder entirely, and the resultant accumulation of residual urine forms an excellent culture medium for bacteria. For this reason it is essential during the preparation of patients with hypertrophy of the prostate, in the presence of urinary infection, to see that the bladder is kept entirely empty either by means of an indwelling urethral catheter which can be satisfactorily used in 75 per cent. of cases as shown by Hunt and Bumpus, or by means of suprapubic cystostomy.

The preoperative treatment of patients with benign hypertrophy of the prostate has materially assisted in the reduction of the mortality rate of prostatectomy. In 204 consecutive operations for prostatectomy performed between January 1 and October 1, 1925, by Hunt and myself, there were three deaths, one of which occurrred from facial erysipelas on the thirtieth day following the prostatectomy from causes entirely remote from the operation. For the most part, prostatectomy was suprapubic, with the exception of approximately 10 per cent. of my own cases in which the operation was performed, for one reason or another, by the perineal route.

Approach to the prostate.—In a discussion of any operative procedure, it should be borne in mind that when more than one procedure can be used for the treatment of a surgical condition, the one chosen should be that which can be followed with the greatest degree of safety to the patient and which carries the least risk of unpleasant postoperative complications and sequelæ.

In general, there are indications for both the suprapubic and the perineal methods of approaching the hypertrophied prostate, depending on the condition of the patient and the specific pathologic condition of the urinary tract. When routine preliminary preparation of all patients with urinary obstruction is carried out prior to operation and the patient's condition enables him to withstand operation, the risk of prostatectomy is approximately the same whether the gland is removed through a suprapubic or a perineal incision. The suprapubic transvesical approach has the advantage that it permits the removal of co-existent lesions of the urinary tract, such as vesical stones and diverticula or even tumours of the bladder. While this is impossible in a one-stage perineal operation, exploration and drainage of the bladder preliminary to perineal prostatectomy, as carried out by Lowsley, overcomes this disadvantage. On the other hand, Bugbee has obtained his best results by performing suprapubic prostatectomy in two stages as a routine, treating associated lesions of the bladder and providing drainage at the first operation, and later, when the condition of the patient permits, enucleating the gland after enlarging the suprapubic drainage sinus sufficiently to permit the introduction of the finger into the bladder.

Without preliminary preparation, including control of urinary infection, and in the absence of studies of renal function to determine the capacity of the kidneys, the risk of a one-stage operation may be lower when the prostate is removed through a perineal incision, on account of the dependent drainage and because the perivesical tissues have not been opened to infection. When the prostate is small and considerable prostatitis is present, the perineal operation can be expected to give good results. This applies particularly when the obstruction is a result of compression of the prostatic portion of the urethra by adenomas of the lateral

lobes. Previous operations on the bladder may cause it to contract to the extent that the perineal approach to the hypertrophied gland becomes preferable. Postoperative ventral hernia complicating such previous operations may indicate a perineal operation which can be thus performed without fear of opening the peritoneal cavity. Recently it was necessary to perform perineal prostatectomy in a case in which a large postoperative ventral hernia had developed following three previous operations on the bladder elsewhere for the removal of vesical stones.

Should the perineal approach be chosen, the technic of Young has become classic as a model. Davis has devised a hemostatic bag to be used after perineal prostatectomy and this has proved as satisfactory in the control of immediate hemorrhage following perineal prostatectomy as the Hagner-Pilcher bag in the suprapubic operation. Still considerable experience is required for perineal prostatectomy, if uniformly good results, as measured by urinary control and healing without fistula, are to be expected. Occasionally, even after skillfully performed perineal prostatectomy, these unpleasant sequelæ occur and may necessitate secondary operations.

The determination of the patient's condition prior to operation and the restoration of patients handicapped as a result of obstruction of the urinary tract, have assisted greatly in reducing the mortality rate of prostatectomy. Whether the operation is to be performed in one or two stages, suprapubically or perineally, is dependent on the general condition of the patient, the pathologic condition of the urinary tract, and the experience of the surgeon, for what in the hands of one is a safe operative procedure with little possibility of postoperative complications, in the hands of another becomes an operation of necessity rather than of choice.

In general, after preliminary preparation for operation, if the condition of the patient is such as to permit of safe prostatectomy, it makes little difference from the standpoint of mortality rate, whether the gland is removed through a suprapubic or a perineal incision.

The Nonsurgical Management of Peptic Ulcer by the "Physiologic Rest" Method.—The material analyzed by Frank Smithies, Chicago, comprises 470 patients affected with ulcers and who were treated nonsurgically according to Smithies' plan published in 1916. In the hospital cases, the average duration of incarceration was twenty-six days, a saving of nearly half the time and money required by the regimen advocated by Ewald, Schultz, Sippy and others. Actual bed confinement averaged less than nine days. In forty per cent of patients, all pain had disappeared within twenty-four hours of beginning treatment; an added thirty-three per cent experienced pain relief within forty-eight hours; eight per cent required seventy-two hours; fifteen per cent almost ninety-six hours; in approximately four per cent, it was necessary to relieve pain by opiates. The last group consisted of ulcers whose extension had advanced to the serous layer of the stomach, or the ulcers were of the deep, fissured type, directly located at the pyloric or cardiac orifice. A total of eighty-one per cent were subjectively comfortable in three days or less. Of forty-one per cent of ulcers exhibiting positive occult blood tests when treatment was begun, at the end of five days ninety-two per cent of the patients' stools were blood-free. Seven cases went on to actual perforation (1.5 per cent). In sixty-six patients who came to laparotomy for numerous intra-abdominal lesions, following institution of ulcer management, completely healed scars were demonstrated in fifty-four, approximately eighty-two per cent. In the remaining twelve patients, malignancy, perforation, multiple ulceration or actual, benign ulcer activity were present. Dyspepsia-free intervals averaging eleven months were recorded in 234 cases before treatment; it lengthened to thirty-seven months as an average after treatment. Thirty-two patients before treatment had had quiescent periods averaging nineteen months; after treatment those on whom we have reports had increased to an average of forty-four months. *Jour. Am. Med. Ass.* Aug. 29, 1925.

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RABIES*

By Capt. R. H. Malone, M.D., I.M.S.

Montreal

OUR attention has recently been directed to the subject of rabies by an outbreak which started about two weeks ago in the Gatineau district, in which a fairly large number of cattle and sheep and five boys were bitten by rabid dogs. The disease has now spread over the neighbouring parts of Ontario and Quebec, and seems to have caused, temporarily at least, a certain amount of panic in the Public Health Departments of these provinces.

It seemed to me to be an opportune moment for refreshing our memories concerning the etiology, symptoms and prevention of this disease which is happily so rare in Canada; this is my apology for bringing the subject before you.

Rabies is a specific communicable disease affecting the central nervous system: it is most commonly found in the canine race, dogs, wolves, foxes and jackals. But it can be and is often transmitted to man and other animals through the bite of an infected animal.

The brain, spinal cord, nerves, cerebro-spinal fluid and saliva contain the infecting virus, the nature of which is still unknown; the pancreas, adrenals and mammary glands may also contain the virus.

The incubation period in the dog varies from a week to about six months and in 75 per cent of the cases lies between two weeks and two months. In man the time is more variable but in about 75 per cent of the cases lies between three weeks and three months.

Once symptoms have developed the result is invariably death: there is not a single authenticated case of recovery in man, and it is exceedingly improbable that a dog ever recovers once it has become rabid. Although we have no means of curing the disease, we have in anti-rabic vaccine a method of preventive treatment, effectual if employed during the incubation period. During this period only is rabies a preventible disease.

These are the fundamental facts about rabies that everyone should know. It may be said that very few cases occur in this country, and that if an outbreak does take place, it can easily be stamped out by adequate police measures, and that therefore rabies is a disease of no importance. From the statistician's point of view this may be correct, but three facts will cause you to re-consider the question; (1) although it is rare at present, there is no guarantee that this happy state of affairs will continue; (2) that the prevention of the introduction of rabies into this country, and its control once introduced, may not be an easy proposition unless police measures are strictly enforced. It must be remembered that Canada is separated from a country where rabies is endemic, only by a more or less imaginary boundary line some thousands of miles in extent, and this line is crossed daily by tourists and hunters, who are permitted to bring their dogs with them; (3) no disease with a mortality rate of 100 per cent can be classed as unimportant.

Should rabies occur in a district or city the medical man, especially if he be a country practitioner, would be expected to know enough about the disease to enable him: (1) to spot a rabid animal, or to have reasonable grounds for suspecting the presence of rabies in an animal; (2) to advise the owner of a suspected or rabid animal what he should do to safeguard his own interests and those of his neighbours; (3) to lay down the procedure to be adopted in the case of persons bitten, scratched or licked, or who have otherwise come in contact with a suspected or provedly rabid animal; (4) to recognize rabies in man; (5) to educate the public to appreciate that rabies is a preventible disease if proper means are taken in time; and to disabuse their minds of fallacious ideas about the disease which have been handed down to us from the days of Aristotle. It is from this point of view that we shall consider the subject tonight. I have nothing new to tell you; in fact

* Paper read before the Montreal Medico-Chirurgical Society, February 5, 1926.

there is nothing fundamentally new that has been learnt about rabies since Pasteur's time, but I can speak from experience gained during two years of work in Pasteur Institutes in India and Burma where the disease is prevalent.

Rabies is known to have occurred in a great variety of animals. Besides the dog, wolf, fox, jackal and man, it has been observed in the elephant, leopard, camel, horse, cow, deer, sheep, goat, pig, cat, fowl and even in the skunk. For practical purposes we need only consider the dog and man.

To take up our first question: How can the presence of rabies in a dog be detected? Two types of rabies are usually described: the furious type which agrees fairly well with the popular conception of "the mad dog"; and the paralytic or dumb type which does not strike the imagination so forcibly and is often unrecognized by the layman. The difference between the two is one of degree rather than of kind, and the same virus may produce the furious type in one dog and the paralytic in another. All rabid dogs pass through a stage of cerebral excitability and a stage of paralysis. In the furious dog the excitable stage is pronounced and prolonged; in the paralytic form it is short and may be so slightly marked as to escape observation.

A typically rabid dog exhibits three stages. In the first, he is dull and depressed at times and is fidgety, nervous and restless at other times. In the second he is excitable, delirious, furious, even maniacal. In the third he is helpless and paralysed. One of the earliest signs is an alteration from his normal behaviour. He may be more friendly and affectionate than usual, not so self-reliant and constantly looking for sympathy; or he may be sullen, morose, wrinkling his forehead and eyebrows with suspicion and distrust. He is feverish; his appetite is disordered, eating things he never would have touched in normal health, such as hair, wool, straw, wood, earth, dung and so on. Later he becomes irritable, shy and uneasy, crouching away on being touched, restless, creeping under furniture, avoiding bright light, easily excited, snapping or springing at objects that exist only in his imagination, walking aimlessly about the house and wandering away from home. At this time the earliest signs of paralysis may be seen in his altered gait and difficulty in swallowing food. He is apt to vomit, and his voice becomes strange. When he barks the voice sounds hoarse: the tone is low at the beginning and high pitched at the end, more like a howl than a bark, and his jaws do not snap together after each bark as they normally do, on account of a paretic condition of the lower jaw.

As the disease progresses the dog becomes more excitable, furious and even maniacal. He bites or snaps at men and animals, tears up carpets, woodwork or anything else near him. Outbursts of fury alternate with periods of exhaustion. In his fury he often seems to be insensible to pain, lacerating his mouth, breaking his teeth and even gnawing his own body. If he escapes from home he is liable to run amuck travelling sometimes great distances, and biting all and sundry in his path.

In a few hours, or it may be a day or two, the paroxysms of fury become shorter and weaker and the periods of exhaustion longer and more marked. His voice is entirely lost. He is intensely thirsty and will try to drink but finds it impossible: there is no hydrophobia as is seen in man. He is very emaciated, weak, scarcely able to stand, dyspnœic, swaying from side to side or trembling all over. His legs become completely paralyzed, convulsions occur and death soon takes place. The whole course of the disease is never prolonged beyond ten days. Death usually occurs in four to six days.

The dumb or paralytic form is said to occur in about 20 per cent of cases, but I am inclined to think it is more frequent than that, as stray or ownerless dogs, the pariah dog of the Indian bazaar, suffering from paralytic rabies may go away to die in some quiet or obscure corner: his corpse is found later and the disease is unrecognized and not reported as rabies.

In this form the stage of cerebral excitability passes rapidly on to the stage of paralysis; the disease runs a shorter course and may be unrecognized. The animal is depressed and abnormally quiet, constipated and refuses to eat. He is less apt to snap at objects and is soon unable to do so on account of paralysis of the lower jaw. Food drops out of his mouth; saliva drools out from the corners of his mouth. He lies almost motionless, with eyes fixed and expressionless. His voice is lost early and paralysis of the hind limbs appears early,

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emaciation takes place rapidly and the dog dies in three or four days in a condition of coma.

A dog with this form of rabies is potentially dangerous. He looks so miserable and pathetic that unsuspecting and sympathetic persons are apt to pick him up, pat or caress him. The owner often suspects a "bone in the throat" and may handle or examine his mouth and throat without being aware of the danger he is running.

This is a sort of composite picture of rabies. All dogs do not present all these symptoms, but it is rare indeed when some at least of the characteristic symptoms are not present.

In the case of a stray or ownerless dog the diagnosis may be a difficult matter. You will have no connected history of the case and may not have a chance of seeing the symptoms develop. In such a case you will be guided by the appearance of the dog and such information as you can pick up. Did it bite man and animals indiscriminately? Were several persons bitten within a short time? and in case of death, did the animal die within ten days? In many cases the final proof depends on microscopic examination of the brain, and on the result of experimental inoculations into laboratory animals. During an outbreak of rabies all stray dogs which have bitten men and animals indiscriminately should be considered as rabid.

Now we come to the second question. What advice should be given to the owner of a suspected or rabid dog? Chain him up and keep him confined and under observation for ten days. If he is alive at the end of ten days, he is not rabid. If he dies within ten days, cut off his head, (or better, remove the entire brain); pack it in 50 per cent glycerine and send it to the nearest laboratory. Handle the animal, his chain, collar and anything else that may have come in contact with his saliva with gloves on. Be especially careful in examining him for a "bone in the throat". Warn the owner that the dog's saliva may have been infective three to five days before he noticed any symptoms of the disease. Disinfect the kennel, chain, collar, etc. If the dog is proved to be rabid advise him to report the matter to the police, and inform them about all dogs which may have been in contact with the rabid dog for a period extending from five days before symptoms developed until the death of the animal. The presence of stray or ownerless dogs in the district should be reported to the police.

The third question. What procedure is to be adopted in the case of persons who have been in contact with a suspected dog? All bites, scratches, or abrasions which may have been soiled with saliva are cauterized with strong nitric or carbolic acid as soon as possible. Treat each wound or abrasion thoroughly and separately using a probe where necessary. Advise anti-rabic vaccine treatment no matter how slight the apparent risk or how doubtful the diagnosis may be. The earlier the treatment is commenced the greater is the chance of success. If the dog is alive on the tenth day of the disease treatment may be discontinued. If the dog dies within ten days continue the treatment whether the laboratory confirm the diagnosis or not. Don't let anyone "get away" with the idea that there is no risk from licks, from handling the dog's chain and so on.

The question of risk is a very subtle one. We all know that the risk of infection increases with the number and depth and character of the wounds and their proximity to the head or face. It must be explained however that people have been known to contract rabies after the most trivial contact with the virus; that it will not be known whether he has been infected, or not until symptoms develop, and that once symptoms have developed he can say good-by to this world. He must therefore accept treatment or refuse it on his own responsibility. Never "pooh-pooh" or minimize the danger to him.

Now a word about treatment. This is a complicated and highly technical subject but the gist of it is as follows: The virus obtained from a rabid animal, naturally infected, is known as "street virus". By passing "street virus" from rabbit to rabbit by sub-dural or intracranial inoculation, the incubation period of the disease is gradually reduced and finally becomes constant so that an infected rabbit shows symptoms on the sixth day, dying normally on the eighth or ninth day. The virus is now called "fixed virus". It is specially infective for rabbits by the intracranial route, but has largely lost its infectivity when given by the subcutaneous route.

Vaccine is always prepared from "fixed

virus'' and the methods of preparing vary widely. Two general methods are in vogue (1) the use of living fixed virus, attenuated by drying, heat, or dilution, (2) dead fixed virus killed by chemicals, usually carbolic acid.

In the first method separate portions of the spinal cord are dried for one to fourteen days. Each portion of the cord, suitably treated and emulsified in normal saline, constitutes a dose. The treatment usually begins with the least virulent cord, dried for fourteen days and ending with the most virulent cord, dried for one day. The actual practice varies widely: some Pasteur Institutes begin with an eight day cord, others with four day cord and so on. One inoculation into the flank is given each day for fourteen days or longer: sometimes intravenous injections are given. In the second method the whole brain and cord are pounded up in a mortar with 1 per cent carbolized saline, incubated at 37°C. for twenty-four hours and then diluted to make a 1 per cent brain suspension in 0.5 per cent carbolized saline. The vaccine is bottled and shipped out in doses of 4-5 c.c. each. This method has been used in India since 1912; it is certainly more convenient, less expensive and just as efficacious as the original Pasteur method or any of its modifications, besides being totally devoid of risk.

Now we come to the fourth question. How would you recognize a case of rabies in man? (1) By the history of having been in contact with a rabid dog (this is usually but not always obtainable) followed by an uneventful incubation period. (2) By the development of a period of mental unrest, nervousness, irritability, depression, anxiety lasting two or three days. Often there is a burning sensation, itching, tingling or numbness at the site of the old wound which has long since been perfectly healed. (3) By a period of cerebral irritation; hyperæsthesia of all the senses: hallucinations of sight, hearing or smell. A feeling of suffocation. Spasmodic contraction of the pharynx and larynx on attempting to eat or drink. This progresses until convulsions ensue, clonic in character: these may be slight and of short duration to commence with, gradually becoming severe and prolonged, and at times almost maniacal in their intensity. The slightest noise or movement, bright light, a draught of fresh air may be sufficient to start a convulsion. The patient is intensely thirsty but the sight of water or any other liquid or even the suggestion or thought of drinking sets up a severe spasm of the pharynx and larynx which leaves him gasping for breath (this of course is the characteristic symptom known as hydrophobia). Another symptom is the frequent spitting in the endeavour to get rid of saliva which is not attempted to be swallowed.

During a convulsion the pupils dilate, the pulse is full and strong, respiration irregular and rapid, skin moist and perspiring, face anxious, agitated and wild or dull and stupid. Priapism and seminal emissions are not uncommon. In the intervals between attacks, consciousness and intelligence are unimpaired, the patient however being restless, anxious and often talkative. Respirations become normal and the pulse weaker. Other symptoms are insomnia and elevation of temperature; urine is passed in small quantities only and may contain sugar and albumen. The patient rapidly becomes emaciated seeming to lose weight under one's eyes.

This stage seldom lasts longer than a day or two and passes gradually into the final stage of paralysis. The convulsions become feebler and finally cease, the pulse becomes very weak, the skin cold. The patient completely exhausted may die quickly in a comatose condition or from asphyxia during a convulsion. Consciousness may remain until just before death. No treatment is of any avail. The usual sedatives, morphia, hyoscine, chloroform or tetradotoxyl (a new Japanese preparation) are palliatives which have been tried.

Our last question is concerned with the prevention of the disease. As rabies is a disease occurring largely in the canine population, it can be and should be fairly easily controlled. England has stamped it out by three simple measures. A dog tax, and the licensing of all dogs; unlicensed dogs being liable to impounding or destruction. Quarantine; keeping all imported dogs in close quarantine for six months at the owner's expense. Muzzling all dogs during an outbreak and for at least one year after last case has occurred. In Berlin, in the Department of the Seine, in Denmark and Sweden rabies has been reduced to neglible proportions by similar measures. In Australia

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it has never occurred owing to the rigid enforcement of quarantine. In Japan a new method has been tried with apparent success, viz., the active immunization of the dog population by means of anti-rabic vaccine. In New York State all infected districts are quarantined. Unfortunately all the states are not as careful, and rabies is spreading more and more over the United States; in fact it seems to have occurred in every State in the Union.

Rabies was probably introduced into Canada in 1810, when there was a severe outbreak in Ohio. In 1820, the Duke of Richmond, then Governor-General of Canada, died of hydrophobia from the bite of a captive fox. In 1904, a little dog trotted over the suspension bridge at Queenston from New York State, bit a number of dogs, cattle, and sheep and trotted back again. Since then rabies has remained in Canada. It has spread from Ontario to Manitoba, Saskatchewan and Alberta. Cases have been reported in British Columbia too. Quebec seems to have remained free until this last outbreak.

THE TOXÆMIAS OF PREGNANCY FROM THE VIEWPOINT OF ETIOLOGY

By E. K. Maclellan, M.D.

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OBSTETRICIANS the world over are vitally concerned to-day with the problem of the etiology of those conditions which are grouped under the name "Toxæmias of Pregnancy." To date no completely satisfactory explanation has been forthcoming. A vast amount of experimental work is being done and much valuable information has been collected. Theories have been advanced almost by the score. Of these theories there are two which have more appeal to reason than any of the others. I refer to the chorionic theory and the theory that has recently been advanced which places the blame on an absence of consanguinity between mother and fœtus. The chorionic theory has probably more in its favour than the second. There are some difficulties however to its acceptance. It does not explain why in some instances the chorion throws off a poison so violent that its results have been compared by Leith Murray to those produced by cobra venom, and in other cases not only is no damage sustained by the maternal organism, but actually an improvement in the state of health is often to be noted. Experimental work has failed to reveal any evidence which would indicate that a diseased state of the chorion exists in toxic cases.

The theory of absence of consanguinity between mother and child has recently been under investigation. Zotterman and Wildner in a series of 213 cases found incompatibility in 26.9 per cent. McQuarrie found 70 per cent incompatible in a series of toxæmic cases as opposed to 11.4 per cent incompatible among his normal patients. In concluding a review of McQuarrie's work C. O. Maland states "Although the data submitted in this paper are not sufficient to warrant the drawing of final conclusions, they are very suggestive of the existence of some relationship between the incompatibility of maternal and fœtal blood on the one hand and the development of eclampsia or pre-eclamptic toxæmia on the other. Such a theory, however, should be regarded as merely tentative, and cannot be accepted until a satisfactory mechanism has been demonstrated by which the fœtal blood can gain access to the maternal circulation."* To this theory there is also the insurmountable objection that eclampsia occurs in cases of hydatidiform mole in which the fœtus has been destroyed and also the fact that it may occur several days *post partum* when the only trace of the ovum which remains in the uterus is a certain amount of chorionic débris.

The correlation of these two theories has suggested itself to me as a means of explaining the

* *American Journal of Obstetrics & Gynæcology*, September, 1925, p. 446.

weak points of each, and of arriving at a definite understanding as to the etiology of the "toxæmias."

In a toxic case we would then assume that there is incompatibility between the blood of the fœtus and that of the mother, *and that this incompatibility is shared by the cells of all other tissues of the two individuals.* The chorion being of fœtal origin would, under these circumstances, be toxic to the mother. In its position where it is constantly being bathed by maternal blood it is ideally situated to cause trouble. The finding of cells of the syncitium free in the maternal blood stream by Schmorl and Veit may then indicate that a sharp reaction due to this antagonism has resulted in the separation of the cells. Herein may also lie a solution of the contradictory results of the Abderhalden test. An interesting analogy to this theory has been suggested as an explanation of the failure of skin grafts to "take" where the grafted tissue is alien. It is interesting also to conjecture how the pathological findings in a case dead of eclampsia would compare with those in another killed by the repeated introduction of incompatible alien blood, in doses gradually increasing until a lethal result was obtained. I believe the changes would be found to be very similar.

The theory seems to me to have definite possibilities and I believe it will be of some value even though it should turn out to be of a negative sort by means of its disproof.

Rickets, Ultra-Violet Light and Milk.—The prevention and control of rickets could probably be accomplished were it possible to furnish to the infant suitable amounts of the anti-rachitic substance in its food, mother's serum, or milk. The fact that ultra-violet light, properly used, will prevent or cure rickets leads to the hypothesis that ultra-violet treatment of the mother might cause the anti-rachitic substance to be increased in the milk which she gave. To test this hypothesis Holstein-Friesian cows of nearly the same age and calving date and receiving like treatment as to feed, temperature, etc., were placed side by side in the university dairy barn. Throughout the experiment these cows did not leave the barn. For one month none of the cows received ultra-violet light. For the second month two cows received ultra-violet light fifteen minutes a day generated from a Cooper-Hewitt alternating current light at three feet above their backs. For the third month these cows received ultra-violet light for thirty minutes a day under the same conditions. In the meantime Rhode Island Red chickens were allowed to develop rickets, shown both clinically and by x-ray photographs. They were divided into two lots, one lot of three chickens receiving milk from the ultra-violet cows, the other of two chickens, milk from the control cows. Both lots received all the milk they wished.

The chickens have now been under treatment fifty days. The lot receiving milk from cows exposed to ultra-violet light are in good condition with no appearance of rickets in x-ray plates. The lot receiving normal milk has moved progressively toward more extreme clinical and x-ray rickets. The experiment has been repeated, using the milk from these same cows on White Leghorn chickens showing clinical and x-ray rickets. Five chickens were in each lot. After thirty-eight days' treatment four of the lot receiving milk from the ultra-violet cows are almost cured of rickets, showing only a very slight stiffness. The fifth chicken shows some stiffness. Four of the lot receiving the normal milk show constantly increasing symptoms of the more advanced stages of clinical rickets. The fifth chicken, with less fully developed rickets at the start of the experiment, now shows little change from its original appearance. Thus while this anti-rachitic milk is an effective agent for the treatment of rickets, it is not in our experience, as immediately effective in treating rickets in severe form as suitable amounts of cod-liver oil or direct exposure of the animal to ultra-violet light.

These results point to the conclusion that more of the substance necessary to cure rickets is absorbed by the cow exposed to ultra-violet light and secreted by her in her milk. *Science,* January 22, 1926.

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Case Reports

ŒDEMA OF BOTH OPTIC DISCS; TUMOUR IN THE SUBSTANCE OF THE CEREBELLUM*

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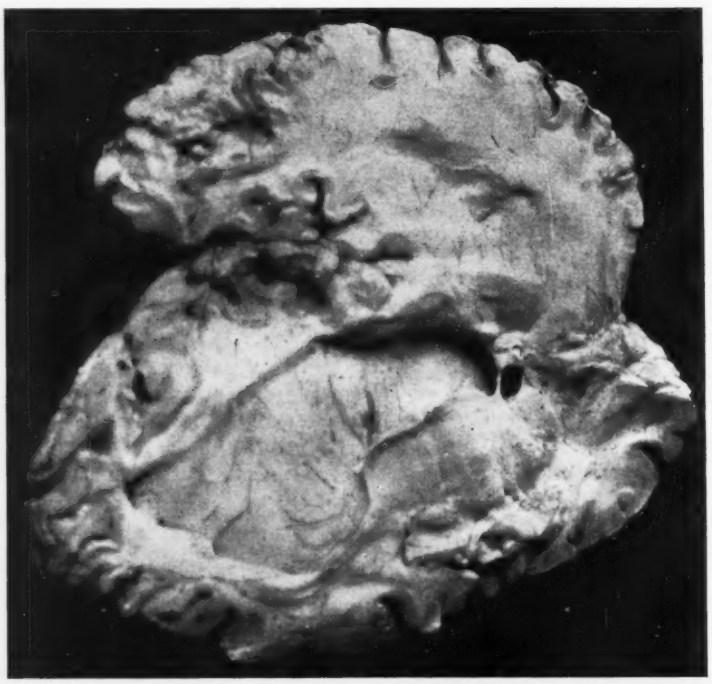
Clinical notes.—A child, A. F., six years of age, was brought to the ophthalmological clinic of the Hotel-Dieu on June 25, 1923, for impaired vision.

Examination of eye grounds showed very pronounced œdema of both optic discs; blood vessels tortuous and congested, particularly the veins; the disc borders were obliterated, and both eyes presented the characteristic swelling of choked disc. The left eye ground showed a large plaque of chorio-retinitis of some standing. *Visual field.* No apparent restriction, scotomas were difficult to make out on account of the youth of the patient. Sight equal to 30/60 on each side. *Ocular movements* were perfect excepting a slight paresis of the right external rectus on the left side. *The pupils* were dilated, reacting poorly to light, but quite well to accommodation. Intelligence normal. The striking feature was an increased size of the skull and the erratic gait of the patient.

The family history was negative. Examination of heart, lungs and kidneys was negative. *Lumbar puncture,* which was done with great care to avoid sudden lowering of pressure, revealed albumin, blood and globulin. No leucocytes found. *The Wassermann* test of the blood and spinal fluid was negative.

Neurological Examination.—Mobility.—There is present no motor defect, muscular power seems quite normal when the child makes voluntary movements or resists passive movements of different portions of the limbs. However, the child can neither walk nor hold himself upright without support. In walking the whole body bends forward and he would fall if he were not held (anteropulsion). Equilibrium in standing and walking maintained in a swaying manner, which

* Paper read before the Société Médicale de Montreal on December 2, 1925.



Enormous dilatation of the ventricles.

indicated undoubtedly a marked involvement of the cerebellar functions.

When the child is seated and the equilibrium of the body assured, one ascertains again the disturbance of the co-ordination mechanism in the isolated movements of the limbs. The test of the finger coming in contact with the nose, shows that orientation is normal, but there is abruptness, the finger going beyond the object (hypermetria) and the hand shakes slightly, thus producing an appearance of intentional tremor. While diadokokinesis is well marked and shows itself in the movement of flexion and extension, as in the classic test of reversing of the forearm. The co-ordination difficulties are much more marked on the left than on the right side, and are particularly distinct in the upper limbs. There also exists on this same side a certain stiffness or muscular hypertonicity, shown by the passive movements of bending and extending the forearm.

Sensation.—Examination was not made in detail, but there was neither astereognosia nor disturbance of the muscular sense, so that one could see that the awkwardness, the ataxia, and inco-ordination of the little patient depended more on the improper functioning of the cerebellar apparatus, than on a disturbance of deep sensation.

Tendon reflexes were feeble in the upper limbs, but more marked in the lower limbs, where the patellar reflex had a clonic character. On both sides the Babinski sign is present, as well as the ankle clonus, but this last phenomenon is perhaps more marked on the right.

Cranial nerves.—Negative, with the exception of the paresis of the right external rectus on the left side already mentioned.

Summary.—Marked enlargement of the head. Intellect sound. Absence of signs of cortical irritation.

Neurological diagnosis.—Probably intra-cerebellar neoplasm occupying the left lobe, producing early internal hydrocephalus by compression of the aqueduct of Sylvius; this would explain the preponderance of the hypertension phenomena and the presence of the signs called hypophysial.

Nystagmus.—Spontaneous nystagmus appears well marked on both sides, but possibly more pronounced on the affected side. It has become augmented with the progress of the illness.

Radiography.—The anterior clinoid process is well shown. The floor of the sella turcica seems destroyed and the sphenoidal sinus appears invaded.

Glioma of the cerebellum.

Summary description of the tissue which proved to be a glioma of the cerebellum. Specimen remains in the Museum of the Faculty. No. 489. Description by Dr. Eugene Latreille.

Treatment.—Sodium iodide, mercurials, deep x-ray treatment.

Progress.—The symptoms steadily increased in intensity. The child became unable to stand up. Motor inco-ordination became more and more pronounced. Vision remained practically unaltered up to one week preceding death, when the child could with difficulty only perceive objects presented to him.

The important points to consider are:

1. Objective symptoms; œdema of both optic discs, following intracranial compression and macrocephalia.

2. Subjective symptoms; signs of defect in cerebellum, shown by the walk and inco-ordination of movements, and finally by the crises of intense headache, followed by vomiting and rigidity of the neck, which symptoms occurred quite frequently prior to his death, which took

place on October 3, 1923, following signs of bulbar congestion and compression.

With H. Claude and Levy Valensi, we may say that accurate diagnosis of tumours of the cerebellum is difficult—"Numerous difficulties are encountered; sometimes the cerebellar symptoms are prominent, as in the case which we report, but numerous also are the cases where the cerebellar symptoms are masked, hidden in the cranial hypertension phenomena."

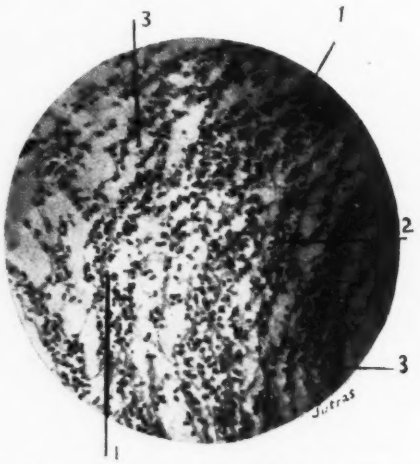
Our restricted neurological knowledge hinders us from attempting a complete study of the differential diagnosis. The question was, above all, to eliminate the indefinite cerebellar signs, that is to say the action of hypertension on the cerebellum, its compression by a neighbouring tumour and particularly the alteration of the connections with the cerebral peduncles and the bulbar protuberance.

The acoustic tests of Barany were all negative, demonstrating the integrity of the vestibulocochlear apparatus, thus eliminating the labyrinthine syndrome, because we know that staggering, the drunken gait, the wandering, the vertigo, the spontaneous mystagmus, the vomiting, etc., are common to cerebellar and labyrinthine lesions.

We believe that we have sufficiently demonstrated the share of the lesions attributed to one and to the other of these organs, by adding that the occlusion of the eyes that produced the labyrinthine and exaggerated lack of equilibrium was also a negative proof.

Finally, we may quote this rule of Grainger, Stewart and Holmes, that the cardinal symptoms of intracranial neoplasms (headache, vomiting, tumour, optic neuritis) make an early appearance in intracerebellar tumours, and are late in extracerebellar.

Our patient not having any ear discharge, we dismissed every supposition of a cerebellar abscess; if we may expect an abscess to be cured by an operation, we cannot expect the same for tumours, and at the present moment an operation can be considered only as palliative treatment. Puncture of the ventricle, and decompression procedures can diminish the suffering and stop the progress of pressure symptoms; the enucleation of encysted tumours has likewise given good results; the statistics of cerebellar operations are not very encouraging and the advanced state of the neoplasm in our patient did not justify an operation with any chance of success. We may also point out that all these operations are extremely grave and may be followed by death after a short interval of a few hours or days from bulbar congestion phenomena.



1, Cluster of sarcomatous cells; 2, capillaries; 3, tumour cells.

The cerebellum, which weighed 270 grammes, appears uniformly enlarged, but a little more enlarged in the left lobe. A transverse section (latero-lateral) discloses the uniform and homogeneous surface of a large soft tumour of gliomateous consistence, large as a small orange, occupying the centre of the cerebellum, encroaching greatly upon the left hemisphere, and projecting on the surface in the form of a spherical lobule as large as a nut on the innermost anterior part of this hemisphere. This tumour is irregularly rounded but perfectly circumscribed and easily enucleated.

Its histological structure is that of a glioma made up of small polymorphous cells, in effect those of a glio-sarcoma. It is composed of a mass of cells, some of which are small, rounded or fusiform, and others larger of irregular outline with filamentous prolongations (spider cells). In certain places these cells are grouped in the manner of a sarcoma; in other places they are isolated, separated, cut off by bundles of nervo gliomatous filaments, forming a veritable network between the diverse cellular elements, as well as between the vessels which are very numerous and are furnished with thin walls (embryonic).

We should not close this report without offer-

ing our thanks to Doctors LaSalle-Archambault and Latreille, the former for his neurological examination, and the latter for having furnished us with the macroscopical and microscopical report of the tumour.

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AN OBSCURE CASE OF ACUTE INTESTINAL OBSTRUCTION DUE TO PRESENCE IN MESENTERY OF SMALL INTESTINE OF A FIBROUS POLYP UNDERGOING CALCARIOUS DEGENERATION.

BY M. T. SULLIVAN, M.D.

Glace Bay, N.S.

A. C., white, male, aged thirty-three years, a mine overman, was admitted to hospital on November 17, 1925.

History.—That same morning about 10.30, shortly after a heavy lift, he experienced a sharp pain in the pyloric region of the stomach, which felt as if a knife was thrust through him. He was brought to the surface a few hours afterwards suffering from severe shock and pain. Morphine, half a grain, was given subcutaneously; external heat was applied and he was transferred at once to hospital.

Previous history.—For the past two years he had been greatly troubled with an acid stomach, which gave him much distress, and frequently induced vomiting; he could only eat certain kinds of food. He also gave the history of pain over the region of the pylorus, with tenderness on pressure. The bowels were regular. A good movement had taken place a few hours previous to the attack of sharp pain.

Condition on admission. — Patient was a healthy, well developed man; weight 189 pounds; temperature 96°; respiration 40; pulse 135. He was still suffering much pain, the morphine having had very little effect. Shock symptoms were very pronounced. Hot turpentine stupes were applied to the abdomen every hour. Two high enemas were given, with a fair result from the second. Patient vomited several times during the night. Next morning the symptoms of shock had passed away. Patient felt very comfortable and expressed a wish to return to work.

Examination.—Thorax, negative. *Abdomen,* marked distension. Abdomen moved slightly with respirations. On *palpation,* both recti muscles were well on guard. There was much tenderness over the region of the appendix and over the pyloric region; about two inches to left side of umbilicus, tenderness was also marked. There was also some slight general abdominal tenderness. *Percussion,* yielded generalized tympanitic note. Liver dullness normal. Rectal examination, did not throw any light on cause.

A diagnosis of perforated pyloric ulcer or acute intestinal obstruction due to some unknown cause was made, and immediate operation was performed.

Operation.—Right rectus incision; much free fluid in abdominal cavity; coils of small intestine much distended at once presented. The appendix was found to be slightly congested, but was otherwise normal. Nothing abnormal was found on examination of stomach. Passing to the left side a very hard, irregular, sharp substance was found which after much difficulty was delivered along with about three feet of small intestine which had become strangulated. At the point of strangulation, the mass was firmly fixed to the bowel and mesentery. At the junction a large hæmatoma had formed, distal to which was a tense band of adhesions which formed the constriction, but which was easily freed. The strangulated bowel was deeply congested, especially in parts, but quite viable. The mass after being dissected out of the mesentery proved to be a fibrous polyp which had become in a large measure calcareous. The abdomen was closed in layers with cigarette drain.

As I reported this case to the Workmen's Compensation Court for compensation, what part did the heavy lift play?

A CASE OF APPARENT HOMOLATERAL HEMIPLEGIA

BY NORMAN VINER, M.D.

Montreal

On October 27, 1923, Mrs. M. R., age fifty-two, Jewess, fell down some cement cellar steps inflicting a severe scalp wound of two inches in

length over the left occipital bone about two inches from the midline and almost parallel with it. About two hours later some neighbours who heard her screams found her lying on her bed, showing that, at some time after the accident, she had been able to raise herself and go upstairs to her room.

Seen the next day, she seemed somewhat dazed, remembering nothing of the incidents of the previous evening, but she was able to make intelligent responses to all questions and respond to all the tests of a neurological examination. This examination revealed absolutely nothing of a pathological character, with the possible exception of evidence of old retinal hæmorrhages due to a marked myopia.

In the course of the next three or four days she gradually became more stuporous, although her responses to questions and tests were still satisfactory. Lumbar puncture at this time showed a pressure of 40 millimetres of mercury as contrasted with a normal of about 10. The fluid drawn off, about 15 c.c., was markedly blood stained, and the pressure was reduced to 15 mm. Two days later several c.c. of blood tinged fluid under considerable pressure were again drawn off. A day or two later another lumbar puncture yielded only a few drops of clear fluid; (this in the light of subsequent events appeared to have been an unsatisfactory tap). On the next day Dr. Henry found again a pressure of 40 mm. which by the withdrawal of about 20 c.c. of clear fluid was reduced to about 18 mm. Finally, on the next day I withdrew 30 c.c. of clear fluid under high pressure.

The object of all this tapping was to reduce the obviously increasing general pressure symptoms, but without a hint of localization. In the course of this period of over two weeks the stupor increased to the extent of almost total unconsciousness, although even then response to a question or a request could still be elicited by much prodding. Vomiting which was at first incessant disappeared after the first two or three days following the accident. Headache of general distribution and dull in character was constantly complained of or intimated. Control of the sphincters was lost about the third day and was not regained until the final outcome. In the early days and again before the operation there was frequent complaint of pain in the left arm and shoulder; this was the only suggestion of a localizing sign in the early stages, and could not be properly estimated at the time. There was occasional picking of the bedclothes more particularly by the left hand. The systolic blood pressure remained uniformly between 145 and 150 until the pre-operation stage when it became erratic, altering from hour to hour and having a range from 126-168. Sensation to cotton and pin-prick was equal on both sides as long as any responses at all were elicited.

The knee jerks early showed a tendency to disappear, as also the Achilles reflexes, with occasional irregularities in the sense that one or other might temporarily recur in either limb. The abdominal reflexes were never in evidence but as this was in a multipara with a fat flabby abdomen this fact did not bear much weight. Finally there was no plantar flexion in the right foot and the only pathological reflex that could be obtained was a slight right Oppenheim towards the end.

About November 15, 1923, on account of the marked stupor and a suggestion of respiratory interference (bulbar compression) I deemed it advisable to send her into the hospital under Dr. Archibald in case a hurried decompression might be indicated. At this time the first localizing symptoms appeared; (false ones as they afterwards turned out to be). The right side lay limp whereas some spontaneous movement of the left side was occasionally observed. Pricking the right side (arm, trunk, leg) with a pin showed no response whereas the left immediately responded to such stimuli. On raising the right arm or leg and letting it drop, it fell limp. The left side on the same test behaved more normally; a calculated sagging down.

On the 16th, Dr. Archibald and myself agreed that it was advisable to go in on the left side of the head as indicated by the evidence of a right hemiplegia. Trephine openings however on the left side in the frontal, parietal and occipital regions were negative. The condition not improving in the next two days, Dr. Archibald decided that a frontal opening on the right side at the point of contre-coup was desirable. As soon as the gouge was introduced and the dura opened a thin stream of inky fluid began to ooze out and before drainage was inserted and the wound closed, a probe around the cavity thus produced served to indicate a space

the size of a man's hand in the right fronto-parietal region between the brain and the bony wall.

Consciousness marked by restlessness and irritability began to return within a few hours, and within one to two days a gradual clearing of intelligence could be noticed with increasing control over the sphincters, and returning reflexes, including the corneal which had been the last to go, disappearing one or two days before the second operation. After this the recovery was uniform and uneventful, and within a month the patient was as well as she had been before the accident, with the exception of a sensation of weakness and an occasional headache.

The features of interest in this case are the late appearance of localizing symptoms, and more particularly their misleading character. In regard to the first point, there was no evidence of fracture of the skull (as verified afterwards by x-ray) nor even of compression. The general symptoms for many days were suggestive, rather, of contusion with marked œdema. In this connection it is worthy of note that there was complete absence of blood in the cerebro-spinal fluid after the first two taps. Moreover the prolongation of the stupor with the associated symptoms indicated something more serious.

Finally, when the right hemiplegia did appear, the conclusion as to the location of the pressure was obvious—and wrong. There can be only two interpretations of this homolateral palsy; one that the pyramidal tracts did not cross in this particular patient—such cases though rare are on record; secondly, that the slow venous oozing on the right side acted as a water-bed, pressing the brain against the bony skull on the left side with more marked pressure on that side of the brain and consequent right hemiplegia. There was only one way in which this point could have been adequately settled, and that was by electrical stimulation of the right motor centres. Fortunately for the patient, however, as adequate drainage of the accumulated and altered venous blood could be achieved through a small trephine hole, there seemed no justification to remove an osteoplastic flap over the motor area merely to settle a scientific point. In view of the absence of this proof, the most logical conclusion as to the cause of this apparent homolateral hemiplegia would seem to have been a pressure transmitted to the opposite side of the brain.

Subsequent note: The patient has been quite well in the interval and on examination on January 19, 1926, showed no residual effects from the accident.

SPONTANEOUS RUPTURE OF EYEBALL

By A. A. Bramley-Moore, B.A., M.D.

Montreal

In nature we meet frequently with what can be called spontaneous rupture, in the full sense of the word—spontaneous—that is "acting according to natural impulse or law". The egg ruptures spontaneously, the pressure applied being that which the organism desires for the fulfilment of its design, and usefulness.

In most branches of medicine the word "spontaneous" is rarely so suitable in its use.

We speak of spontaneous fractures, but in these cases the word is not really a fit one; since we find some unnatural cause at work to bring about the fracture—a sarcoma—or some morbid condition of the bony substance; and we use the word for want of a better; meaning that no form of the usual external violence associated with a fracture, occurred in the case; but the cause came from within, and there was no expectation that it would happen at the precise moment that it actually took place. Spontaneous rupture of normal bone may be said to be impossible; and the same may be said of the normal eye. Rupture of the eyeball from violence is of course common, from direct violence when the blow is actually on the eyeball, and in these cases the rupture is usually at the corneo-scleral margin; from indirect violence when missiles passing rapidly near the eyeball set up pressure waves inside the globe which is sufficiently strong, rupture the globe by contra-coup usually exactly opposite the point of origin.

Cases are reported of so-called spontaneous rupture of eyeballs due to glaucoma; in a few cases without any very severe preceding pain.

In the *British Journal of Opthalmology* of June, 1920, Capt. W. J. Rutherford reported a case under the heading, "spontaneous rupture of a glaucomatous eye," but the patient was suf-

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ficiently ill to be in bed, and suffered from severe pain and headache. One interesting point in his case was that the hæmorrhage through the burst cornea was very slight. With regard to the rupture he uses these words "which was spontaneous, and not caused by vomiting or coughing."

Another case with a closer resemblance to the one I have to report was recorded by N. Bishop Harmon in the same journal,[1] as follows "An injury caused total dislocation of the lens into the posterior chamber, the resulting glaucoma was absolute; and vision was lost. The condition remained quiet for two years without ulceration of the cornea. Three months later without any further accident, the cornea was split horizontally, and the membranes were prolapsed, the cause was a retro-choroidal hæmorrhage."

The case I have to report is probably as near to a perfectly spontaneous rupture as we can get.

Mike D., a Pole, aged thirty, stopped off at Montreal for one day on his way from the west back to Poland. It was a fine sunny morning, and as he walked along Dorchester Street with a friend, he was quite sober and perfectly happy, with no thought of trouble. He had no cough. As he was walking along quietly with his companion, who was doing the talking, he suddenly felt a sharp pain in his left eye, and immediately found himself drenched with blood coming from his eye. He was hurried into the Western Hospital where I saw him a few minutes later stretched on the operating table of the outdoor department. The cornea was burst open, and the contents of the eyeball were extruded; there was profuse hæmorrhage, hard to control, and the patient was feeling very faint, and weak.

Without undressing the man I had the house surgeon give the man a few whiffs of chloroform and at once eviscerated the eyeball; the hæmorrhage ceased at once, and did not recur afterwards.

It was not possible to make an accurate and careful examination of the point of rupture before operation, and the extruded contents of the eyeball were not saved for examination. The history obtained afterwards was as follows: While out west he was injured eight years ago by a piece of steel in the eye, the steel was removed having apparently penetrated the cornea; recovery at the time was speedy, and uneventful. As far as I could gather from an interpreter, the eye was not badly disfigured or scarred, and he had what he thought was good useful vision in it. During the eight years it had given no pain or discomfort, and he had considered it a good eye. The cause of the expulsive hæmorrhage must remain obscure. There was apparently no sign of a new growth inside or outside the sclera.

[1] *British Jour. Ophthal.*, June, 1920, p. 282.

The Physiology of Menstruation.—S. D. Ludlum and E. McDonald recall that the longitudinal muscle of the uterus is stimulated by the vagus and inhibited by the sympathetic system, that the circular muscle is stimulated by the sympathetic and inhibited by the vagus, and that the muscle of the intestine reacts in the same way to the same impulses. Acting on this they have made a number of radiographic examinations of the intestinal muscular tone before and during menstruation. These examinations indicated that normally during the intermenstrual period the innervation inclined towards sympatheticotonia; during menstruation there was a preponderance of vagus stimulation, and during the subsequent five days the smooth muscle reaction gradually returned to normal. They suggest that the pains and cramps associated with menstruation may be due to vagus stimulation of intestinal muscle, and that the constipation which so often occurs at this time may be the result of stimulation of the pelvic branch of the vagus. They believe that Blair Bell's conclusions in regard to the influence of calcium on menstruation are probably correct, and suggest that the vagotonia during this period is, in part at least, due to the accumulation of calcium in the blood and tissues and that calcium is excreted during menstruation. They have found that drugs and salts which inhibit the vagus or stimulate the sympathetic lessen the pain of dysmenorrhœa, and those which stimulate the vagus increase the menstrual pain and flow.—*Brit. Med. Jour.*, Jan. 9, 1925.

Editorial

THE NOBEL LECTURE ON DIABETES AND INSULIN

WE publish in this issue Dr. F. G. Banting's Nobel Lecture delivered at Stockholm on September 15, 1925, on the occasion of the award of the Nobel Prize to himself and Professor J. J. R. Macleod for their work in connection with insulin.

There are not many of our modern recognitions of human accomplishment which have gained so high a place in general esteem as has the Nobel Prize, a prize established for the purpose of promoting peace and human progress by a man whose fortune was made chiefly from the knowledge which he gave to the race of warlike weapons.

Now however, whatever Alfred Nobel may have feared from a misapplication of his discoveries in explosives he may be reassured by the long list of the names of eminent men upon whom his prize has been bestowed and whose researches have contributed so much to human progress.

It is with no little pride that we now chronicle as winners of the prize of last year the names of Canadians and that we are able to publish in this issue the address describing the careful, and steadily pursued researches carried on with much clear thinking, which enabled Banting and his confrères to present to suffering humanity a remedy for one group of its ailments.

Medicine has always found its highest reward in its work, and may it long continue to do so. No one however will criticize the feeling of pride which the profession must feel in hearing the story of a research carried on in spite of difficulties to such a successful conclusion.

PERIODIC HEALTH EXAMINATIONS

IN 1870, Dr. Dobell in England suggested periodic examinations for life insurance companies. In 1900, Dr. George M. Gould, of Philadelphia, contributed a paper to the *Journal of the American Medical Association* in which he advocated "personal biological examinations." Since these early suggestions many years have passed before the general profession has awakened to an appreciation of the value of such personal biological examinations, and of their far-reaching influence in the development of individual and national vigour.

Among the many benefits accruing from the doctrine of preventive medicine is the realization of the fact that the early detection and correction of defects, faulty functions and faulty hygienic habits make not only for longevity but for the physical and mental efficiency of the individual during life. It is for this reason that in recent years, periodical health examinations are being advocated by insurance companies, and are being carried out by an increasing number of them for their policy-holders. As a result of the statistics presented by these insurance companies, the general public is becoming convinced that such periodical examinations are of value. The number of examinations made by the Life Extension Institute of New York is evidence of the increasing demand for this service. It is therefore imperative that the medical profession, as a body, should recognize the importance of this advance in preventive medicine, and should participate in every way in a health measure that is of such obvious individual and national benefit.

In the past, and to a large extent, at

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the present, the average man has accepted his variations from the normal as something to which he should be resigned. The army experiences, and such reports as those of Dublin, Fisk and Kopf demonstrate, the high percentage of men supposedly fit and actively engaged in everyday occupations, who have some physical impairment; also, that this impairment, in many cases, has arisen from, or is due to preventable causes; and lastly, that improvement has resulted from the correction of defects, and the establishment of proper hygienic and dietetic habits. These physical impairments are not confined to the poor. Faulty conditions are frequent in the persons and families of the well-to-do.

Periodic examinations offer the only regular opportunity for the systematic observance of any degenerative changes which may be in the individual. In such examinations the earliest evidence of what may be termed pre-clinical conditions can be detected, and the individual informed whether or not there is a tendency to actual disease. Furthermore observations can be made regarding the effect of the daily regimen of the individual, and regarding abnormal states, and functional and organic defects that arise in those persisting in some faulty conduct of life. Opportunity will be offered for the detection of the first evidences of focal infection, and of the results arising from the persistence of such a focus. Such examinations carried out regularly will unquestionably afford opportunities for observing the primary causes of disease, and the beneficial results which follow advice given, and regimens observed.

In this way, the medical profession will accumulate facts concerning the earliest symptoms or evidence of disease, their significance, and as to how they should be dealt with. The formal training of the average general practitioner of a decade ago scarcely included a proper appreciation of early processes, which we are learning to recognize as responsible for many diseased conditions.

In making these health examinations, it is necessary to have an understanding of the significance of the earliest changes in tissues and organs after detecting abnormality in function, development, or structure. It is appreciated by every practitioner that many cases of tuberculosis, cancer and other pernicious conditions do not present themselves in the early curable stages. A large number of cases of venereal disease remain imperfectly treated, and, in time, may bring on trouble. The discovery of these conditions early would result, if every one were examined once a year. Beyond doubt this periodic health examination must be recognized as of great medical value.

There is also a considerable public demand for it. The medical profession stands at the point where they must either give leadership, and accept the responsibility of providing this service, or stand aside and allow it to pass on to those willing to assume the work in this field of usefulness. Unfortunately, the average physician apparently fails to appreciate the importance of hygienic and dietetic measures in treatment. That, however, does not lessen their value and importance, but emphasizes the need of a changed attitude.

Practising physicians must also realize that their patients are going to judge whether or not the examination they receive is of value. They do not come to be joked with, slapped on the back, and told that they are "fit as a fiddle." The examination can be of the simplest, but it must be done with thoroughness and sincerity. Every practitioner should learn the technique and be prepared to follow a system that is adequate and which will give satisfactory results. He must be prepared to learn to evaluate normal physical fitness, and to appreciate the signs of early change in every system of the body. He must also recognize the desirability of detailed prescriptions to secure the carrying out of hygienic and dietetic regimens.

Health clinics are increasing all over the world. These clinics have demonstrated that people are interested in the matter of health, as evidenced by the numbers that attend. Where school

health services are properly developed, and where the routine health examinations are well given, we find that over half the mothers of the children attend at the time of the examination. The attendance at ante-natal and well-baby clinics increases steadily. The reason is, that the public are persuaded that the examination made is thorough, and of value, and the advice given is worth having.

In Canada, such a routine examination should reach everyone. If it is going to do so, then it must be carried on by the general body of the medical profession, and it must be well done, so that the public will recognize its value.

Various forms have been devised for the recording of these examinations. We insert the one prepared by the American Medical Association. It indicates the character and the completeness of the examination which should be made. A modification will doubtless be prepared by the Executive Committee of the Canadian Medical Association and distributed to its members.

One does not need to be a dreamer to visualize the future possibilities of this work when the physician after an examination of the physical capabilities, the mental and the character capacity and the personality of an individual, will be able to give advice concerning his mode of living, of the work he should undertake, and thus assume an important new relationship to families under his care. While

PERIODIC HEALTH EXAMINATION*

FORM A — **HISTORY FORM**

Use check mark (√) in making answer to questions wherever possible.

1. **Name** — **Country of Birth**
2. **Address** — **White** — **Colored**
3. Age — Religion — **Single** — **Married** — **Widowed** — **Divorced**
4. **What is your present occupation**
5. Have you changed your work frequently — Why
6. **What are the conditions of your work**

Regular	Dangerous	Dark	Smelly	Seated	Hours per day
Satisfactory	Fatiguing	Light	Noisy	Standing	Days per week
Monotonous	Indoors Out	Dusty	Crowded	Walking	

7. Are your earnings sufficient to support yourself and dependents comfortably
8. **What are your home conditions**

In a family	Congenial	Quiet	Room and bed to yourself
Alone	Depressing	Irritating	Time to yourself

9. **What are your sleeping conditions**

Hours in bed	Windows open	Restful	Disturbed

10. **How often do you eat**

Regularly	Where	Between meals	Time of meals

11. **Are you a moderate or hearty eater,** taking one or more helpings at a meal of

Meat (including fish and eggs)	Pie, Cake or Pastry	Salads
Baked beans	Sweets or Sugar	Bread
Green vegetables (spinach, cabbage, etc.)	Fruits	Butter
Potatoes (rice, macaroni or cereal)		

12. **How much do you drink daily of**

Milk	Tea	Soft drinks	
Water	Coffee	Alcoholic drinks	

13. How frequently do you use candy — How much tobacco
14. **Do you have a movement of the bowels daily** — With the use of drugs
15. What exercise do you take in addition to your work
16. What are your social, religious, political, club or trade associations
17. What are your pleasures — Recreations — Hobbies
18. **Are you subject to worries** — **Moods** — **Periods of alternating gloom and cheerfulness**
19. **Have you ever been ill with any of the following, or any other severe illness and at what ages**

Tuberculosis	Scarlet Fever	Frequent Colds	
Malaria	Diphtheria	Convulsive seizures	
Rheumatism	Typhoid Fever	Nervous Breakdown	
Syphilis or Gonorrhoea	Tonsillitis (Sore Throat)	Migraine or Neuralgia	

20. **Have you been protected against small pox** — **typhoid** — **diphtheria** — **or other diseases by vaccination and when**
21. Have you had any accidents, broken bones or surgical operations
22. How often do you consult your dentist — When last
23. **Are your parents, brothers and sisters living**
    If not what were the causes of death and at what ages
24. Have either of your parents or any brother or sister had consumption — cancer
    Insanity — epilepsy — gout — diabetes
25. **Do you consider yourself in good health** — If not, what is your complaint

For Women

26. **Are your monthly periods regular** — Prolonged — Excessive
27. **Have they interfered with your occupation** — In what way
28. **Have pregnancies and confinements been free from accident**

*Copied from form prepared by *American Medical Association.*

Form A **PHYSICAL EXAMINATION RECORD**

Name Case No. Date

1. Height Weight, Present Pulse Bl. Pres. { Sys. / Dias.
Usual
Standard
(for age and height)

Hearing R Vision R Corrected R
L L L

Urine: appearance Sp. Gr. Alb. Sugar

Feces (when indicated): appearance Blood Parasites

Record only abnormal conditions

2. **Standing**
Posture
Musculature
Nutrition
Skin
Superficial Glands
Female Breast
Hands
Arms
Male Genitalia
Hernia
Legs
Feet
Romberg sign

3. **Sitting**
Hair
Eye Reflexes
Nose
Teeth
Gums
Tongue
Tonsils
Pharynx
Ears
Chest
Heart
Lungs
Visceral Ptoses

4. **Lying Down**
Abdomen
Reflexes
Sensation
Liver
Spleen
Kidneys
Prostate Gland
Female genitalia
Rectum (hemorrhoids)

5. **Summary:** Defects of function and structure and errors of habit

6. **Advice given to the patient:**

we recognize that some cases may require the services of specialists, and consultations may be thought necessary, yet the final personal advice should come from the family physician. This newer field of work as soon as its importance is recognized and entered upon by the profession will we believe prove a fresh tie between the family, and its own medical adviser.

J.S.F., C.F.M., A.G.F.

INDUSTRIAL DISEASE AND THE PROFESSION

NO branch of preventive medicine is of more importance and has greater claim on the profession than disease in industry arising from defective hygiene in the workshop, and lack of effective precautions against the injurious or poisonous effects of the materials with which they are working.

The importance of hygiene looms large when we consider the numbers in all our cities and towns who make their living in industry as opposed to agriculture and clerical work. There are hundreds of thousands in Canada, men and women and even children a few years over

puberty, who whether they like it or not, have to accept the working conditions in the special industry in which they have the necessary skill; the great majority of them ignorant and regardless of the hazards to health that may be associated with their special labour.

We are living today in what has been termed a machinery age and there are no problems of more vital importance to the existence of our present civilization than those concerned with the industrial units of society. It becomes more and more apparent that the chief difficulties occasioning the disturbed social conditions of today can only be removed through the adjustment of environment to those working in it, and, insofar as may be possible, the adaptation of the workers to their conditions of employment. Less than twenty years ago it was deemed by those in authority, that there was but one fundamental factor in industry, *viz.* production; but far-sighted employers have come to realize that there is another factor equally essential, and this is the health and strength of the employed, and their spirit of service. Early in the Great War it was remarked that it was impossible to make an A-1 army out of a C-3 population. It is equally certain that our Canadian industries cannot maintain their place in the world's competition unless the employees are in good physical condition. To secure this effective state of affairs in the workshop, business men, and employers of all forms of industry must turn to the profession for advice and counsel.

The physician in industry at the present day must to some extent be a specialist. The requirements of industrial medical practice are such that the physician in industry must be conversant with the fundamentals of industrial relations, plant organization, and operation, safety engineering, psychological and fatigue problems, industrial toxicology, sanitation, housing, pension plans, social insurance, and recreational activities, all in addition to matters more directly relating to medicine and surgery. He must be prepared to assume responsibility in connection with the prevention as well as the cure of disease, and have a true conception of the obligations of industry to its workers, and through them to the community and the nation.

The problems connected with plant sanitation are most fundamental, and it is the duty of the physician in industry to maintain all the plant in such a condition that work may be carried on under the best possible hygienic conditions. In attaining this aim the specific problems before the physician will vary with the nature of the industry and the physical condition of the plant and its surroundings; and at all times there must be the closest co-operation between the industrial physician and the sanitary engineer.

The modern industrial system had its beginning in Italy during the 15th and 16th century and is responsible for taking man out of his natural pastoral environment, and making it necessary for him to learn the use of strange tools and the operation of complicated machinery With the passing of domestic and handicraft production came a concentration of population in manufacturing districts. Only slowly did industrial workers realize that steam and speed and impure air did not improve their lot in life Only within the past few years has the profession begun to understand and appreciate the underlying facts affecting the health of these industrial workers. Health in industry rests on several important principles. It cannot exist without good hygienic conditions in the workshop and the observance of well defined hygienic laws by the employees. It demands that the spirit of service and goodwill should pervade the whole industry. It calls for efficient preventive measures against accident and disease as well as for prompt first aid, and well devised curative measures. It must also take into consideration home and community conditions.

Success in industrial health work must also depend in great measure on the development among the workers themselves of a care for their own bodies. Those employees who are most receptive of instruction in the hygienic principles of living and working will be rewarded by enjoying the best health and the most

effective working powers and all that this implies from the standpoint of financial return.

At the annual meeting of the Association of Industrial Physicians of America, held three years ago, the following definition of the physician in industry was adopted. "The physician in industry is one who applies the principles of modern medicine and surgery to the industrial worker, sick or well, supplementing the remedial agencies of medicine by the sound application of hygiene, sanitation and accident prevention, and who, in addition, has an adequate and co-operative appreciation of the social, economic and administrative problems and responsibilities of industry in its relation to society."

There are at present in the United States some eighteen colleges and universities which give special instruction in industrial medicine, and it is a matter of great importance that the governing authorities of Canadian Universities should take active interest in the conservation of the human resources of Canada, the most mportant of all its resources. Canada ranks fourth in industrial importance among the members of the League of Nations. Nearly a decade has passed since the establishment of a course in Industrial Medicine in Harvard Medical School. The experience obtained in connection with a special outdoor clinic in the Massachusetts General Hospital has not only demonstrated the great value of such instruction but has shown the need for a more extensive programme of study than was at first attempted.

We publish with pleasure in this number a series of essays read before the Committee on Industrial Hygiene appointed by the Ontario Medical Association, acting under the able chairmanship of Prof. V. E. Henderson of the University of Toronto. No more important subject can be brought before the attention of our Medical Societies, Dominion as well as Provincial. We sincerely hope that the university authorities of every province in this Dominion will consider the organization not only of an industrial clinic in connection with their hospitals, but the establishment of a definite chair of instruction in connection with this most important department of preventive medcine. University graduate courses should be established, which should include the subjects of industrial toxicology, industrial medical and surgical practice and psychiatry, industrial operation, and industrial sanitation. We must all recognize that at the present day industrial medicine is assuming a position of fundamental importance in the conservation of the human resources of the nation and offers opportunities to our universities to contribute in an important way to that end.

LIGHT, PHOTOSYNTHESIS AND VITAMINES

IN a recent address* to the section in Pathology, Bacteriology and Biochemistry, of the Royal Institute of Public Health, Professor E. C. C. Baly, of Liverpool University, described recent researches he has been engaged in, which concern the influence of light on the synthesis of carbohydrates, amino acids and alkaloids from the very simplest chemical compounds—water, carbon dioxide, ammonia, and nitrates—and in concluding gave free rein to his imagination in discussing the strange similarity in the action of vitamines and light. The statements herein contained are based upon this address and upon other published work of its author.

Professor Baly regards the investigations of himself and his collaborators as having settled definitely the problem of the synthesis of carbohydrate from carbon dioxide, water and light energy. The steps involved in the process are (1) the formation of formaldehyde from car-

*BALY, *Journal of State Medicine*, 33, No. 8 (1925).

bon dioxide and water and (2) the polymerization of the formaldehyde to a reducing sugar. Moore and Webster were able to demonstrate the first step only when uranium salts were present, but Baly has shown that the two processes are accomplished by light of different wave lengths—the first requiring $\lambda = \mu\mu$. the second $\lambda = 290\ \mu\mu$. By adding paraldehyde to the carbon di-oxide solution the formaldehyde formed was protected from transformation to sugar through the absorption of the longer wave lengths by the formaldehyde. The positive results which Moore and Webster obtained when uranium nitrate was added to the carbon dioxide solution Baly explains as due to this salt acting similarly to paraldehyde. If the longer wave lengths are not absorbed the formaldehyde formed is quickly converted to a sugar.

Since in nature it is well known that plants thrive under glass and therefore in light from which the short wave lengths have been removed, the necessary energy to derive carbohydrate from water and carbon dioxide must come from the longer wave lengths. These cannot be utilized by the plant directly but, apparently, if these long wave lengths are first absorbed by some substance such as chlorophyll, they may then be liberated as waves of such length that they are then available for the formation of formaldehyde and subsequently catalyse its conversion into sugar. Baly has found a few coloured organic compounds which function to a certain extent in the same way that chlorophyll may in the plant; they may be called photocatalysts. If the carbon dioxide solution radiated contains a nitrogenous compound such as potassium nitrite, the formaldehyde formed reduces the nitrite and complex nitrogen-containing compounds are formed. Among these are amino acids and ring compounds such as are present in alkaloids. Indeed, in one experiment in which ammonia was used, instead of potassium nitrite the alkaloid coniine was identified. Inasmuch as the quantities of the other substances formed were small, they have been identified conclusively only in the cases of pyridine, piperidine and methylamine.

Because of the important place which light holds in the synthesis of chemical compounds of biological importance and also in the proper assimilation of certain food elements as indicated by researches of the last year or two upon the effect of light in rickets, it has occurred to Professor Baly that the action of vitamines may be interpreted on the basis of light phenomena. He regards these mysterious substances as compounds which have absorbed a large amount of energy from light of short wave lengths, and thinks that for some not at all apparent reason, some such compounds high in energy are essential for certain physiological processes. It must be admitted that the similarity of vitamine and light action is very strange, but the idea promulgated is pure speculation. It leaves the vitamines just what they were before, viz: chemical compounds as yet unisolated. If they are formed as a result of a process involving the absorption of light energy as are the carbohydrates, it is well to know that much, but even this is yet to be proven.

R. L. Stehle

CARBON DIOXIDE AND RESPIRATION

THE significance of the volume and of the several ingredients of the air that a man breathes were first clearly grasped and explained by Haldane of Oxford, and the interpretation which he gave of the influence which carbon dioxide exerts upon respiration is one of the most important contributions that modern physiology has made to the science and art of medicine. Carbon dioxide is produced in the body by the same process by which oxygen is consumed. Many of our readers may remember only what they were taught years ago that carbon dioxide was the waste

product of animal metabolism, and of use merely for the chemical purposes of plant life, and will marvel at the great respect now being paid to this "inert" gas. Oxygen has relatively little immediate influence upon the act of respiration. The administration of oxygen gas never acts as a stimulant. Carbon dioxide on the contrary is a definite stimulant to the respiratory centre, and is therefore the regulator of the depth and rate at which respiration is carried on.

Respiration is a function of very great variability. Its rate may vary from four or five times a minute to twenty, thirty or more. The volume of air breathed may vary from five litres a minute to thirty, fifty or more. In an address delivered under the auspices of the Dental Board of the United Kingdom, Professor Yandell Henderson said it was unfortunate that respiration was usually thought of and quoted in terms of its rate. The really important fact was the volume of air breathed in a minute. It is the amount, or more exactly the pressure of carbon dioxide in the air in the lungs, and therefore also in the arterial blood flowing from the lungs, which acts upon the respiratory centre so imperatively, that in normal conditions the volume of air breathed is kept in exact proportion to the amount of carbon dioxide in the blood; even with the great variation of carbon dioxide production which takes place during bodily rest and in vigorous muscular work, the depth and frequency of the respiratory act is determined by the amount of carbon dioxide in the blood. In other words the lungs are automatically ventilated, so that the air which they contain has under normal conditions a content of a little more than five per cent of carbon dioxide, that is, about fifty per cent more of carbon dioxide than is contained in fresh air. This concentration of carbon dioxide in the residual air in the pulmonary passages is of extreme importance, and is one of the prime factors not only in respiratory activity but also in the acid base balance of the blood and tissues. Regarding the value of carbon dioxide as a controller of respiration in anæsthesia we would refer our readers to the abstract of an address given by Professor Yandell Henderson, which appears in our present number, and to which we have already referred.

Beyond the use of carbon dioxide as a means of controlling respiration in anæsthesia, it is of great value in other conditions in which respiration is defective. It has been used with success in overcoming the asphyxia of the new-born. A brief inhalation from a cylinder of mixed oxygen and carbon dioxide has very promptly stimulated the respiratory centre and started breathing in several cases in which difficulty arose in new-born children.

Another valuable use to which the inhalation of carbon dioxide has been put is in the treatment of alcoholic intoxication, and especially in cases of intoxication with methyl alcohol which is ordinarily only slowly excreted and is often very poisonous in its effects. By the administration of carbon dioxide mixed with air, or possibly in some cases with oxygen even a comatose alcoholic may be made to respire deeply and thus ventilate the alcohol out of his blood and his lungs in the course of an hour or so, and be fit to be discharged from the hospital sober and well the next morning.

Still another and even more important use of carbon dioxide has been developed in connection with carbon monoxide asphyxia. Such cases are liable to occur in every city where the amount of carbon monoxide in the public gas supply is allowed to rise above a small amount. Carbon monoxide poisoning may also occasionally occur among men in a fire brigade who may be overcome by smoke which is alway liable to contain considerable amounts of this monoxide gas. A similar condition may also be met with as the result of explosions and fires in coal mines, and is the chief cause of the fatalities connected with these. The thoughts of the professional man in these cases is apt to turn to the administration of oxygen, but as Henderson has shown an asphyxiated man breathes so imperfectly that oxygen is not adequately inhaled and in many cases does little good, whereas a mixture of oxygen with carbon dioxide

administered through an effective inhaler induces promptly an increase in the depth of respiration and enables the blood in the lungs to be flushed and flooded with the oxygen in the mixture.

Professor Henderson makes another important point in connection with this administration of oxygen and carbon dioxide. Persons partially asphyxiated and left to recover of themselves very frequently develop pneumonia. In fact in the past a considerable percentage of the deaths following asphyxia of all kinds has been in consequence of a secondary pneumonia. On the other hand patients treated with oxygen and carbon dioxide shortly after their asphyxiation recover rapidly from the asphyxia and are thereby relieved of the danger of pneumonia. A similar claim is made by Professor Henderson, to which reference is made in our abstract of his address, that by the use of oxygen and carbon dioxide after anæsthesia the danger of post anæsthetic pneumonia may be almost entirely eliminated.

In a previous issue we referred to the fact that in cases of carbon monoxide poisoning Professor Haldane recommended as the most effectual treatment that any onlooker should make a breathing tube from a roll of paper and breathe expired air into the lungs of the asphyxiated man. We note that in an editorial article in a recent number of the *British Medical Journal* reference is made to the use by the prophet Elisha of this method of mouth to mouth insufflation in the resuscitation with complete success of the son of the Shunamite woman.

THE MODE OF ACTION OF INSULIN ON CARBOHYDRATE METABOLISM

FOLLOWING upon the fundamental discovery of Von Mering and Minkowski in 1880, which indicated with practical certainty that the pancreas elaborated a substance the deprivation of which resulted in a glycosuria, numerous researches were directed to the proof of this indication. As is well known now, such proof was obtained in its purest form by Banting, Best, Collip and Macleod. This second discovery, which must be regarded as a corollary of the first—a point not sufficiently emphasized—has in the last few years been followed by another series of researches of great theoretical interest concerning the chemistry of insulin action. Among the latest of these researches is one of particular interest because it comes from Minkowski's clinic in Breslau.[1] It represents an attempt to determine whether or not at least a part of the action of insulin is upon the metabolism of carbohydrate in the muscles, for it appears to have been demonstrated satisfactorily that in diabetic dogs insulin does affect the liver, facilitating the formation of glycogen in that organ. The method which the Breslau workers used consisted in measuring the dextrose content (reducing power) of arterial blood taken from the left ventricle and of venous blood taken from femoral vein before and after insulin was injected into the femoral artery of the same leg. The results indicate clearly that after the introduction of insulin there is decidedly less dextrose in the blood of the femoral vein than there would have been had no insulin been given. Moreover, when venous blood from the leg receiving no injection of insulin was examined, it was found as was to be expected, to contain more dextrose than the blood of the leg receiving insulin. The results were obtained with both normal and depancreatized animals. Nothing is indicated in these experiments concerning the fate of the dextrose which disappeared, but it seems reasonable, at any rate tentatively, to put these experiments together with recent ones of Lundsgaurd and Holboll,[2] and regard the dextrose as having been oxidized. The latter

workers have recently found that through the combined action of insulin and muscle tissue, dextrose is transformed into what they call "new sugar," into which, it may be, carbohydrates must be transformed before they are utilizable. Similar, though not so convincing, evidence for this transformation has already been presented by other workers.

REFERENCES

(1) FRANK, NOTHMANN AND WAGNER, *Archiv für experimentelle Pathologie und Pharmakologie*, 110, 225, (1925). (2) LUNDSGAARD AND HOLBOLL, *Journal of Biological Chemistry*, 65, 305 (1925).

AN OSLER MEMORIAL

AT a recent medical dinner in Hamilton, Dr. Leonard Rowntree, the guest of the evening, a Canadian, and a former pupil, and for some years an assistant of Dr. Osler in the wards of the Johns Hopkins Hospital, urged that the Hamilton Medical Society should raise some memorial to Sir William Osler. Wentworth County and the town of Dundas held the family home around which the memories of his boyhood chiefly clung, as his father had moved to it from Bond Head whilst his years were yet young.

All in Canada, and, inded, we may say American Medicine generally, acknowledges indebtedness to Osler for greatly improving clinical training, broadening the outlook of the profession, and adding greatly to its idealism. As Rowntree said, "Because of this influence the Canadian medical profession enjoys added prestige everywhere; as Canadians, our debt is large."

The *Journal* congratulates the Hamilton Medical Society on the promptness and spirit with which it has risen to this suggestion. Osler certainly is the man whose work and memory the Canadian profession generally should delight to honour. Still, the Hamilton Medical Society must remember that to some extent his memory has already been honoured by medical societies in nearly every large Canadian city and at every Canadian University. Osler Clubs, Osler Reporting Societies, and Osler Clinical Societies are scattered throughout the Dominion from Halifax to Vancouver and Victoria.

We are, however, entirely in accord with the members of the Hamilton Medical Society that thus far our nemorials are insufficient. It is, undoubtedly, very desirable that some permanent memorials should be erected to Sir William Osler and one very properly at the family home in Dundas on the side of the hill near the Rectory close to the path along which young Osler frequently passed on his way to investigate the mysteries of the Dundas Marsh. We also think that the Canadian Medical Association should establish an Osler Club and have an address in medicine presented at its meetings, annually or bi-annually, in which some feature of Osler's character or of his teaching should be emphasized. To both these plans we promise all the assistance we can render.

Other suggestions have been made; some of them are of an extensive character, and have to deal with the establishment of memorial scholarships. Such will probably follow in time, but, at the present, all propositions involving considerable amounts of money must be left to the future for individual bequest or university endowment. Enough for us to quote the excerpt from Osler's writings already quoted by the Committee, "We have ideals, which mean much, and they are realizable, which means more."

Editorial Comments

Dr. Dublin of the Metropolitan Life Insurance Company and his colleagues Messrs Kopf and VanDuren, have summarized in a few concentrated paragraphs their study of the experience of the industrial department of the Metropolitan Life Insurance Company for the twelve years from 1911 to 1922. The data refer to 90,175 deaths from cancer among the many million policy holders located in the United States and Canada. With the exception of tuberculosis and heart disease, more money was paid out on account of cancer than for any other cause of death.

During the whole period included in this study, cancer was the fifth cause of death in numerical importance among their industrial policy holders. No important change in the death rate from cancer has taken place during this decade. There has been a slight increase among males in the more advanced age groups; but also a slight fall in the mortality between thirty-five and fifty-five years of age, which may mean there has been some response to the campaign of education for cancer prevention at this age. The most frequent seat of fatal cancer was the stomach and liver. This accounted for more than one-third of all the deaths from malignant growth. Cancer of the female genital organs ranked second. Cancer of the breast took third place. Like cancer of the genital organs it was more frequent among coloured than among white women. It was rarely met with before the decade between twenty-five and thirty-four, but became rapidly more prevalent between thirty-five and forty-five. After forty-five years the rate continued to rise and reached its highest percentage in the most advanced age groups.

CANCER

In view of the great prevalence of cancer, it would be advisable that physicians suspect all tumours, especially those in the breast as possibly malignant, or possibile of becoming so, in the not distant future. Even nodules which appear quite benign may contain the nucleus of cancerous change. If such is the case, how unwise is it for a physician to give a patient the assurance that a nodule is of no importance, or to advise delay for a month or two for further examination. In some cases at least, a cancerous growth does not develop a nodule sufficiently large to be discovered by the patient before several months have elapsed. For several years, my advice has been the removal and thorough examination of the nodule; if it is benign, nothing more is required; if malignant, of course, a radical operation should be done without delay. This course may save the patient a dangerous possibility, and the physician a grave responsibility. To delay action for a month or two may result in infection of neighbouring lymphatic glands in the axilla and even beyond, and render a complete cure impossible.

A. M.

Dr. Burton T. Simpson in the Campaign Notes of the American Society for the Control of Cancer in a short paper emphasizes the danger of the frequent manipulation of breast tumours. There is an inherent tendency in a person who has a lump in the breast to repeatedly feel it. Too often this excessive palpation of the tumour is not limited to the patient alone, but not infrequently, friends to whom she may show it palpate it unduly and sometimes, even the examining physician who is consulted may be under the circumstances over-zealous. Mortality from cancer of the breast is second only to that of cancer of the uterus in the female. It is discernible early, is easily accessible, and in this early stage is susceptible to complete removal. The high mortality connected with cancer in this locality is too often due to premature metastases brought about by massage.

In the breast cancer of white mice, early metastases can be produced almost at will by manipulating the tumour frequently for a few days. This danger of manipulation should be brought home not only to the laity but also to the medical profession.

The following Societies propose holding their

next annual meetings in Montreal on May 31st, June 1st, 2nd, 3rd, 4th and 5th, 1926:

1. The American Otological Society.
2. The American Laryngological Society.
3. The American Laryngological, Rhinological and Otological Society.
4. The American Bronchoscopic Society.

This is the first time, with the exception of the American Laryngological Society, that the meetings have been held outside of the United States, and on this occasion Professor R. Magnus of the Imperial University of Utrecht, Holland, will be the guest of honour of the American Otological and American Laryngological, Rhinological and Otological Societies, when he will read the following paper:

"The co-operation or interference of reflexes from very sensitive organs with those evoked from the labyrinth."

It is expected that there will be a very large attendance of the members at these meetings, as indicated by the number of interesting papers to be read. The meetings will be open to the medical profession, and will be held in the Ball Room of the Mount Royal Hotel.

We have received the preliminary programme of the Third Congress of French speaking Dermatologists and Syphilographers, to be held in Brussels July 25th to 28th, 1926.

This includes papers on tuberculosis, syphilitic infection, endocrine disorders of hereditary syphilitic origin and on the present state of treatment of lupus and of cutaneous tuberculosis. We are to be informed of any alterations or additions that may be made to the programme. Communications regarding this Congress may be addressed to Dr. Dekeyser, Secretary General, 9 Rue des Sablons, Brussels.

Paroxysmal Rhinorrhœa.—J. Freeman (*Jour. of Laryngol. and Otol.*, September, 1925, p. 561 describes the peculiar sensibility of the nasal mucosa of certain people to proteins of various nature—egg albumen and grass pollen being two common examples. He has been able to sensitize his own and his colleagues' nasal mucosa to various proteins, and to produce attacks of rhinorrhœa at will. In cases of hay fever he has found that injection of the pollen into the dermis only produces local symptoms, but by giving pollen in the food, vomiting, diarrhœa, and giddiness were incited. He injected pollen into a vein and produced massive urticaria, headache, and asthma, but only a moderate amount of rhinorrhœa. If the serum of a sensitive man is injected into the subcutaneous tissue of a healthy man the overlying area of skin will become sensitive for some weeks. Sensitiveness is sometimes hereditary, and Freeman reports two families which illustrated this most clearly. He considers that protein sensitiveness is the most important factor in paroxysmal rhinorrhœa, but he recognizes that there is a nervous element and that traumatic and pathological conditions in the nose may have a part in causing the disease. A. Brown Kelly (Ibid., p. 563), discussing the condition from the clinical point of view, states that hypertrophic conditions of the turbinals and mucosa, the formation of polypi, and such conditions have usually been present for some time before the onset of the paroxysmal attacks, but in some cases these may not appear until the rhinorrhœa has been in force for some time. He finds that in a large proportion of the cases there is a marked hyperæsthesia to touch and other stimuli. J. Adams considers that asthma and hay fever may be caused by toxæmia, by errors in diet, and by abnormal conditions in the nose, such as deflected septum. Treatment should aim at removing all sources of toxæmia and abnormalities, and at instituting a healthy régime in the patient's life. Margaret Tod has followed up over two hundred patients with asthma upon whom operations had been performed. She found that removal of tonsils and adenoids, turbinotomy, and submucous resection of the deflected septum were followed by the best results. Removal of nasal polypi and of adenoids was productive of only very moderate results, and cauterization was particularly disappointing.—*Brit. Med. Jour.*, Nov. 28, 1925.

Correspondence

A PLEA FOR THE USE OF "THE COMBINED TREATMENT" IN AFFECTIONS OTHER THAN THOSE OF THE EYE

To the Editor:

I am making an addition to the list of the few diseases given in a previous article in this *Journal* under the same heading*, as at that time I deemed it advisable not to mention it, but have since decided to do so.

There is a disease which so often foils the best efforts of physicians, known as pernicious anæmia. From my point of view, the cause seems to be a peculiar degeneration taking place in certain nerve centres, which gives rise to this insidious alteration of the blood.

Looking at it in this way, "The Combined Treatment"† through its very powerful and sustained effect upon the nervous system, should, I hold, be a suitable remedy and should give hopes of success. Length of time would be needed in the treatment, but this should be readily granted, if an improvement were soon demonstrated.

In my bad cases of diseased eyes I have learned, that if I could once establish an improvement, then my prognosis would be favourable: for the ability of the "Combined Treatment" to keep up this improvement when once begun, has been too often shown, to be doubted. Of course I have no reference to cases evidently already gone too far to hope for a good result even if an improvement from the treatment.

At the present time I have a case of very peculiar degenerative condition of a large leucoma, the result of a corneal ulcer, which is recovering under the use of "The Combined Treatment." It was a condition which I had never before treated, and had given rise to total destruction of the other eye, originating in a similar large leucoma. I began the treatment because, if no curative condition could be established, total blindness, as in the other eye, would follow.

Before I began the use of the treatment, I excised the other, the lost eye under a local anæsthetic. "The Combined Treatment" has been continuously used for four years with most beneficial effect, and with additional treatment of the same kind a cure will have been effected: and then I purpose to report the case; for it seems to be unique and to be another most severe test, successfully borne, of the revivifying power of "The Combined Treatment." The general health of the patient, a woman aged fifty years, is now most excellent, and the nervous system is of very full vigour, but a physiological vigour.

One might remark in regard to this advocacy of the use of "The Combined Treatment" with respect to pernicious anæmia, how can you do this, when so little is known as to the cause, and you do only give a theoretical reason? My answer is, that in regard to diseases of the eye, which have been so successfully treated by the use of this treatment, my reason for its employment was purely theoretical. Moreover, my hypothesis has always been and is now that "The Combined Treatment" acts upon and through the nervous system.

I am in the same position with regard to this disease, pernicious anæmia: but with this difference, that I am now encouraged and strengthened as to the favourable outcome of this suggestion of mine by the acquired knowledge of the far reaching powers for good of "The Combined Treatment," this acquired knowledge being the gradual accumulation of my experience of its good results in many most testful, even desperate cases, and previous to its employment, some of them were even regarded as hopeless.

I might also take the liberty of bringing to your notice, that "The Combined Treatment" is the outcome of the following condition, which is, that there were some diseases of the eye in which our treatment was not fully satisfactory, and others, which we oculists were unable to treat successfully, in other words, we had to say, that they were incurable, as far as our own efforts were concerned. Ever since I became an oculist I have always been thinking how to overcome this gap

* G. Herbert Burnham.—A plea for the use of "The Combined Treatment" in affections other than those of the eye. *Can. Med. Assoc. Jour.*, June, 1925.

† G. Herbert Burnham.—"The Combined Treatment" of Diseases of the Eye, published by H. K. Lewis, 136 Gower Street, London, 1906.

in our successes, and "The Combined Treatment" seems to have narrowed this gap.

In addressing the physician I am speaking to him of certain types of disease, *i.e.*, some diseases in which his curative measures are not fully satisfactory, and others for which he has no form of treatment on which he can rely, in other words he is baffled. In these types only am I trying to interest him, and these, of course are limited in a way, which could be explained, were one given the opportunity of actual practice.

I should like to mention the following case, though it has reference to the article of June, 1925. Since writing that paper, a woman with right sided paralysis and disturbance of speech, due to a cerebral hæmorrhage, I was asked to see as she was suffering from an inflammation of the right eye. I found an infiltration of the lower part of the cornea associated with a mild iritis. Under treatment the eye was saved, but with a leucoma and an anterior synechia, a result, which I do not consider satisfactory, though under the circumstances, I am aware, many would regard it, as a good one. This case from my point of view was a fit and proper one for the employment of "The Combined Treatment."

My opinion is, that had the treatment been used, the recovery of the eye would have been more complete and the cerebral condition would have shown a greater improvement.

To draw attention to the extremes of the ages of the patients to whom it has been administered, it may be mentioned that I have at the present time under "The Combined Treatment," a case of acute sympathetic ophthalmia in a child, five years of age, which is doing well and will ultimately recover with normal vision: and another child, six years old with decided nebulous condition of each cornea, very much impairing vision, the result of old keratitis, which under the treatment will become clear, restoring good vision: and also, I treated successfully, some years ago, a case of cyclo-iritis after cataract extraction in a man, aged eighty-two years.

G. Herbert Burnham, M.D.
(*Tor.*); F.R.C.S., (*Ed.*)

Toronto, February 7, 1926.

Men and Books

THE STORY OF FIFTY-FOUR YEARS' QUARANTINE SERVICE FROM 1866 TO 1920

By F. Montizambert, C.M.G., I.S.O., M.D., (Edin.), F.R.C.S.E., D.C.L.

Foreword

Previous to Confederation the protection of the public health, and especially that afforded by the quarantine service, was in the hands of the Governments of Upper and Lower Canada, and under the authority of the Quarantine Act, of 1794, and was directed chiefly to quarantine against the entrance of disease from foreign countries especially through the ports on the St. Lawrence.

Notwithstanding the operation of this measure, there were in the first half of the nineteenth century several sharp outbreaks of cholera in the two provinces (1832-34 and in 1849), and of typhus fever (1845-47). A central board of health was established in 1849, and because of a further outbreak of cholera in 1866 new and more stringent regulations for the protection of the public health were adopted. In this year Dr. Frederick Montizambert was appointed medical superintendent, at the Grosse Isle quarantine station. Here follows the interesting story of fifty-four years' continuous service with the Government of Canada, which he has been good enough to prepare from notes taken at the time.

John W. S. McCullough

Quarantine inspection by the Canadian Government of incoming vessels was first established in 1832, when typhus fever was raging in Europe, and especially in Ireland. Over 100,000 immigrants sailed that year but the mortality was very heavy on the long journey across and at the detention station at Grosse Isle. Only a skeleton staff was then kept at this point thirty miles below Quebec: the staff consisting of one medical superintendent, Dr. Von Iffland, and a few minor officials. The chief inspection prior to 1866 was carried out at Quebec. In the year 1847 another recurrence took place of this very fatal epidemic, and on a small monument on Grosse Isle is the following inscription "In this secluded spot lie the mortal remains of 5,425 persons who, fleeing from famine and pestilence in Ireland, found in America but a grave." The other faces of the monument record the deaths of several of the medical assistants who also died that year of the dread disease.

In 1866, an epidemic of Asiatic cholera de-

veloped in several countries in Europe, and the Canadian Government ordered that all incoming vessels should be stopped and inspected at Grosse Isle, excepting the mail steamers which were to be inspected at Father Point where they took on their pilot. To further this inspection Dr. Dechene was appointed to attend the hospitals at Grosse Isle under Dr. Von Iffland who remained there as medical superintendent. Dr. Montizambert was given charge of the inspection of incoming steamers at this station, and Dr. Taschereau was directed to inspect the mail steamers at Father Point.

During the following winter both Dr. Dechene and Dr. Taschereau died of tuberculosis. In the following year Dr. Montizambert was stationed at Grosse Isle to act as inspector and medical assistant, under Dr. Von Iffland as superintendent, and all incoming vessels were directed to be examined at that station before they were allowed to proceed up the river. In 1868 Dr. Von Iffland was superannuated on account of his advanced age and infirmities; Dr. Montizambert succeeded him in his position as superintendent and Dr. Patrick Coote was appointed as his assistant. In this year there was a slight recurrence of typhus fever, and Dr. Montizambert unfortunately contracted the disease but recovered.

Prior to the year 1886 the only means the inspecting officers at Grosse Isle had for reaching vessels in the offing was by rowboat. In this year, however, a steam yacht, the *Hygiea*, was placed at the station for the purpose of assisting the inspection and disinfection of ships, and for landing the sick; and in the following year the steamship *Challenger* was added to the service to assist the *Hygiea* which had been overworked and was suitable for day work only. Supplementary quarantine regulations were issued at the same time embodying the following orders: The medical inspection of every vessel arriving from outside of Canadian ports was to be made by officers responsible to the Government, and the evidence of ships' masters and surgeons was to be taken by these government officers under oath. The hours for the inspection of vessels was lengthened to include any hour of the day or night. Heretofore inspections had been made only between sunrise and sunset. Vaccination against smallpox of all passengers and seamen was insisted upon; continued precautions with regard to the importation of rags from infected countries was directed to be taken.

These regulations were adopted on the advice of Dr. Rouch of Chicago, a United States officer who spent some days at Grosse Isle in October, 1885, thoroughly inspected the service, and confirmed all the recommendations of Dr. Montizambert.

In 1889, Dr. Montizambert was appointed as medical superintendent of the whole St. Lawrence quarantine service, and the inspection service at Rimouski was placed completely under his charge. The new duties entailed among others the necessity for the superintendent to go aboard the mail steamers at Rimouski, and inspect thoroughly all immigrants on their passage up. Under arrangements made by Dr. Montizambert, uniformity of administration and method was brought about in all parts of the service. Furthermore, although all the mail steamers were not able to be inspected at Rimouski on every passage up the river, their medical officers never knew on what incoming voyage the inspecting officer would come off, and accompany them up the river and thoroughly investigate the condition of the vessel, and the fact as to whether all the incoming passengers were vaccinated. The necessity for this procedure was shown by the fact that on one of the early inspections the medical officer on board one of the mail steamers signed under oath a written statement that each of the steerage passengers on board either showed signs of having been vaccinated within seven years, or of having had the smallpox within that period. A personal examination made by Dr. Montizambert after leaving Rimouski showed that 198 persons were not protected by vaccination as the law required; of these a large proportion were adults who made no pretence of having been re-vaccinated since their infancy. Many had never been vaccinated at all. During that season 880 persons were vaccinated between Rimouski and Grosse Isle. The effect of this careful inspection and insistence on vaccination, very much improved the standard of service on board these steamers.

In 1890 Dr. Coote, who had been acting as medical assistant for the past three years, was replaced by Dr. F. W. Church who proved himself peculiarly fitted for the office. In this year the American Public Health Association

which met at Charleston, South Carolina, elected Dr. Montizambert as its president for the ensuing year, as a tribute to his scientific work in forwarding the cause of effective quarantine.

In 1892 the spread of Asiatic cholera in Europe, its great prevalence in Hamburg and Antwerp and its appearance at several ports of Great Britain, again led to the enforcement of special quarantine precautions in the St. Lawrence service. The measures taken were crowned with complete success. No case of Asiatic cholera occurred in Canada and under the Act for the prohibition of the importation of rags from infected countries, there were landed and burnt at quarantine more than 500 bales exported from Hamburg to Canada, and which might very possibly have carried much infection. During this year Dr. Wyatt Johnson, the well known pathologist, visited the station and tested the quarantine methods, and found that the measures employed were effective and in every way satisfactory. As disinfection at that time was effected by the fumes of sulphur dioxide, the possibility of fire arising as the result of such disinfection was realized to be possible, and to prevent such an accident Dr. Montizambert devised a special appliance for cooling the fumes as they passed through the reservoir which proved satisfactory, and for the success of which he was congratulated.

In 1893 many important improvements were made at the quarantine station at Grosse Isle. Three steam chambers suitable for disinfection were completed and proved of invaluable service. The needle and rain shower baths placed in special rooms gave entire satisfaction. There was also a very comfortable detention building erected for the saloon passengers, capable of holding 124 occupants with steward, cooks, etc. Two of the existing buildings were fitted with rooms for intermediate passengers with accommodation for 200. An ample supply of water was provided from a 50,000 gallon reservoir. With the consent of the Canadian Government, the United States stationed several of their marine hospital medical officers at Grosse Isle to inspect buildings and methods. After a careful examination Dr. Banks, their senior medical officer, reported as follows: "The work now being done by the Dominion Government is carried on in a most thorough and scientific manner, and has left no room for criticism." At the Pan-American congress held this year in Washington in September, Dr. Montizambert had the honour to be elected as a member of the International Executive Committee to represent Canada.

In this year in his report to the Government he commented as follows: "The sanitary outlook continues to be unfavourable. Asiatic cholera exists in many countries in Europe and in many towns throughout England. However there has been no spread to Canada."

In 1894 the American Public Health Association held its twenty-second annual meeting in Montreal, and at the close of the meeting many of the members were taken on an excursion to visit the St. Lawrence quarantine stations. The general opinion expressed as the result of this visit was one of complete satisfaction at all the methods employed. Previous to this inspection there had been a tendency among our neighbours to the south of us, and especially among those in the more western states on the occurrence of any epidemic in Europe to fear an invasion of the disease by way of Canada, and at times very vexatious inspections and delays were imposed at the frontier, causing obstructions to trade, travel and traffic. This opportunity of showing so many executive officers of the United States health organization the character of our quarantine arrangements was a valuable one, and proved fruitful of good results by showing our visitors, how carefully we were protecting ourselves and in doing so protecting them, and that through-passengers arriving by the St. Lawrence might be as freely and as safely admitted to the western states as if they had arrived by New York or Boston.

In the autumn of 1899 Dr. Montizambert was called to Ottawa by the Honourable Sydney Fisher (who was then Minister of the Interior and had charge of public health affairs) and was directed to open an office in his department from whence he could control the requirements of the quarantine service both in the St. Lawrence and in British Columbia and also the leper lazaretto at Tracadie. He was at the same time given the title of Director General of Public Health and Sanitary Adviser to the Dominion Government with the rank of a Deputy Minister which was afterwards con-

firmed for life by an Act of Parliament in 1905.

In July 1900 smallpox broke out in Dawson City. Dr. Montizambert at once proceeded there and found that the cases were all isolated on an island at a distance of two and a half miles from the city, and were doing well. General vaccination of the community had been enforced.

In 1901 the Minister of Militia appointed Dr. Montizambert as one of a medical board of inspection to investigate the cases of illness that had occurred on the steamer *Montezuma* and to report on the advisability of allowing that vessel to be used as a transport for Canadian troops sailing for South Africa. This board of inspection consisted of Colonel McWatters representing the Imperial authorities, Lieut-Col. Tobin representing the Militia Department, Dr. Farrell general representative, and Dr. Montizambert as representing the Dominion Government. The steamer sailed shortly after the inspection had taken place and permission had been granted.

In 1901 owing to the prevalence of a mild form of smallpox prevalent throughout the United States, additional protection was given to all points on the border where, from the lack of efficient health organizations the importation of smallpox into this country was to be feared. During the same year, effective measures were taken through the various school board trustees, 700 in number, to insist upon the vaccination of every child before it was admitted to school. This rule was promptly and willingly accepted, and requisitions poured in for over 30,000 tubes of smallpox vaccine.

In 1902 as an epidemic of plague existed in many ports in Europe and South America precautions were ordered to prevent the embarkation of any rats at the ports of departure abroad by means of the placing funnels on all hawsers and the careful guarding of the gangplanks; the same measures to be taken at all landing ports.

In this same year, owing to the very frequent interruptions of telegraphic communication with the St. Lawrence quarantine stations, funds were voted for the installation of the Marconi wireless system. In the past almost every year floating ice had crushed or broken the cable greatly interfering with telegraphic communication and the requirements of incoming vessels.

Changes were made also in the quarantine station in British Columbia which was greatly improved. New bathrooms were installed for first class passengers. Houses were erected for the electrician and for the guards, and a right of way outside the boundary fence was acquired. This allowed the guards to watch and patrol the quarantine boundary on the promontory on which the station was placed.

In 1907 an act was passed respecting leprosy, enabling the Government to have control not only of the leper lazaretto at Tracadie, N. B., but also of the lazaretto in British Columbia, and indeed generally throughout the Dominion of Canada. At the Tracadie Leper Lazaretto continued good results followed the internal administration of chaulmoogra oil and strychnine, and the use of creolin outwardly. The patients improved both in health and spirits, the appalling darkness of their former hopeless condition now lightened and brightened by gleams of hope. One patient, a man of forty, apparently was so cured of all symptoms of the disease that Dr. Montizambert felt justified at his last inspection of the lazaretto in approving of his going home, on the condition of his reporting himself from time to time for examination. He had been in the institution for five years. Previous to his release all the ulcerations on his body and limbs had completely healed, and repeated microscopic examinations of mucus from his mouth, throat and nostrils had for some time failed to reveal the presence of the leprosy bacillus.

In 1908 the occurrence of the bubonic plague in San Francisco and other places in the State of California, and in Seattle in the State of Washington, demanded careful watch to prevent its introduction into the Dominion. In June of that year, Dr. Montizambert inspected all the Pacific coast stations of Vancouver and Victoria and all the neighbouring harbours. Under Dr. Montizambert's orders it was directed that all boats from Puget Sound and from the Orient should be breasted out six feet from the piers to prevent rats jumping on and off. They were also to have their mooring lines protected by metal discs. The gangways were to be as few as possible and were to be guarded by quartermasters, watch and watch about. Ar-

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rangements were also made for the fumigation of boats running a ferry service to the Sound, and Customs officers were directed to call for the inspection by medical men of all suspected vessels. Dr. Montizambert also interviewed the managers of all the railway lines and steamer lines and arranged for medical inspection at all the important points on the border.

In 1909 owing to the time which had elapsed since the last cases of human plague in San Francisco and in Seattle the special inspection of passengers and crews from those ports was removed in October, but the measures for excluding rats by breasting vessels from the piers and guarding mooring ropes was maintained in force for some time.

In 1912 as smallpox was epidemic abroad, cases occurred on incoming vessels. At Grosse Isle it was found on five vessels.; at William Head on one vessel; at Halifax on three; and at Louisburg and Sydney, N. S., on one each. In all cases the disease was stamped out at the quarantine station. The epidemic outbreaks of this disease in many of the northern states led to the appointment of temporary inspectors on the frontier.

In this same year the Minister advanced the unorganized maritime quarantine station at Summerside, P. E. I., to the position of a full quarantine station for the inspection of all incoming vessels. The island had this right for federal quarantine protection against disease from her sister provinces of the Dominion as well as from abroad.

In the same year, to meet the increase in the number of mail steamers coming up the St. Lawrence two additional medical officers were appointed to meet the incoming mail steamers at Rimouski. By this addition every mail steamer coming up the St. Lawrence was met by a medical officer and a careful detailed inspection made of the steamer on its way up the river.

At the outbreak of the Great War in 1914 every precaution against disease was taken before the first expeditionary force left its home shore. At the camp at Valcartier in Quebec 27,000 men were inoculated with anti-typhoid serum. The same precautions were taken as far as practicable with all the later forces.

In 1917 the Department of Militia and Defense announced that for the twelve months ending December 31st 1916, only 167 cases of typhoid were reported amongst the 450,000 men of the Canadian Expeditionary Force. This comparative freedom is most striking when it is recalled that during the Boer War one man out of every nine in the British Forces was invalided through this disease. The Provincial Board of Health of Ontario supplied all the typhoid and paratyphoid vaccine used by our entire force; in all nearly 600,000 doses were supplied free of cost.

In 1917 on account of the prevalence of Asiatic cholera in India and China, passengers arriving from those countries at William Head, B. C., were subjected to bacteriological examination and were not admitted for entry into the Dominion until it had been determined by such examination that they were not cholera bacillus carriers. This was continued for several years; 1087 bacteriological examinations were made,—but no cholera carrier was found. In 1920 this examination was suspended as the threatened danger had so far passed that it was deemed to be unnecessary. Similar action was taken at the same time by the United States station.

Dr. Montizambert concludes his interesting history of the Canadian medical service in 1920 as follows: Since my appointment on January 16th, 1899, as Sanitary Adviser to the Dominion Government, I have every year included in my annual reports a synopsis of the progress of infectious disease throughout the world during the year. I have also given a short account of what has been accomplished during that year in the way of the advancement of Sanitary Science, and of any new measures for the treatment and control of epidemic disease. This portion of my report was by Order in Council, October 23, 1917, directed to be discontinued.

During the past year, 1919, at the various stations of the Atlantic and Pacific coasts, 1450 vessels from foreign ports were inspected, and 277,910 persons carefully examined. Admissions to hospital for epidemic disease were 576. In the year previous to the outbreak of the war the number of persons inspected was 706,769. Of these the admissions to the hospital were 1,996. The contagious diseases met with this year were the following: bubonic plague, smallpox, influenza, pneumonia, enteric fever, mumps, dysentery, spinal meningitis, and leprosy. The deaths in hospital numbered 55. In every instance the disease was stamped out in quarantine and did not spread inland.

Bubonic plague appeared on board the S. S. Bahama hailing from Capetown, Colombo, Rangoon and Port Said, in all of which places plague was reported to exist and it arrived at Grosse Isle via Liverpool on July 13, 1919. The crew numbered 93, of whom 50 were East Indians. The captain reported three deaths from influenza and pneumonia. There were twenty sick on arrival. The greater number of these were suffering from influenza, but amongst those sick there were found to be four cases of bubonic plague. This was confirmed by bacteriological examination. Of these one man died, and the other three recovered. A supply of anti-plague serum obtained monthly from the Lister Institute of Preventive Medicine was promptly sent to the station. The vessel's cargo was removed and her holds were disinfected by sulphur fumes, three pounds to the 1,000 cubic feet of space. The vapour was blown in by strong fans. This it was hoped would serve for the destruction of rats on the vessel as well as for disinfection.

Influenza with all its fatal sequelæ prevailed as an epidemic during that summer and autumn, and gave rise to many admissions and not a few deaths at the quarantine station. With the arrival of the first cases early in July, as Sanitary Adviser to the Dominion Government, I recommended favorable consideration of the advisability of including this form of influenza amongst the graver forms of quarantinable diseases to be handled at the quarantine stations. This was at once sanctioned. The United States Public Health Service took similar action later on in September. The virulence of this epidemic of influenza may be estimated by the fact that on one steamer sent from Montreal for quarantine treatment there were eighty-nine cases out of a crew of 177, and on another sixty-four cases out of a crew of ninety-five. Grateful acknowledgements were tendered by the Minister to the medical branch of the Department of Militia who kindly lent to the Grosse Isle quarantine station the services of six nurses and twelve orderlies during the height of this epidemic.

In 1920, Dr. Montizambert was superannuated, and our readers will be glad to know that at this date he is enjoying life quietly in retirement at Ottawa, and even at his advanced age has full control of his mental and physical faculties.

THE DEATH OF THE DUKE OF RICHMOND FROM HYDROPHOBIA IN 1820

In view of the present epidemic of rabies in certain parts of the Provinces of Ontario and Quebec the following account of the death of H. R. H. Duke of Richmond, Governor General of Canada, is of historical and some epidemiological interest. It has been received through the courtesy of Lieutenant-Colonel E. S. Bernard from Dr. J. G. Hayes of Richmond.

There is a very good account of the death of the Duke of Richmond in "Morgan's Sketches of Celebrated Canadians, etc," published in 1862. It is rather too long to transcribe. This book is somewhat rare but may be had in any good city library. A shorter account containing the substantial facts may be had in Gale's Historic tales of Old Quebec, published in Quebec in 1923 by George Gale. He says:

"It was on the 29th of June 1819 that the Duke of Richmond arrived in Quebec and assumed the duties of Governor. While on a visit to the Ottawa district in the following year, he had an attack of hydrophobia and died on the 28th of August, after a brief illness in a log hut in a hamlet known then as Fallowfield, a few miles from Richmond in Upper Canada. His Grace was bitten on the chin by a young fox, owned by one of the officers of the household in the Castle of St. Louis some months previously while he was caressing the animal and as stated above, hydrophopia followed. His remains were brought to this city and interred with great pomp and ceremony in the Anglican Cathedral."

Hawkins in his "Pictures of Quebec" 1832, also makes mention of this death. Also in Sir James Lemoine's "Quebec Past and Present." To Charles Gordon Lennox, fourth Duke of Richmond, Earl of March and Baron of Sittrington in the Peerage of England; Duke of Lennox, Earl of Darnley and Baron Methuen in the Peerage of Scotland, and Duke d'Aubigny in France, the towns of Richmond, P. Q., and Lennoxville owe their names which were applied to these villages shortly after the Duke's death.

It was the self-same Duke who gave the ball in Brussels on the eve of the Battle of Waterloo, commemorated in Lord Byron's poem, "There was a sound of revelry by night."

JOHN HAYES, M.D.

Medical Societies

PROCEEDINGS OF THE ROYAL SOCIETY OF MEDICINE. SECTION OF ANÆSTHETICS, JANUARY 1926

Discussion of Anæsthetics in Children

Dr. Harold Sington.—No time, trouble or patience should be spared in avoiding fright and discomfort at the beginning of anæsthesia in order that there may be as few unpleasant memories and subconscious after effects as possible.

A preliminary dose of atropin before ether is essential and should be given by the mouth. The induction should be as short as possible. Ethyl chloride acts almost instantaneously and is very safe. Ether is the "anæsthetic of choice" for children. To induce anæsthesia with chloroform is dangerous as, indeed, is its use under any circumstances.

Mr. J. Birt.—In the operation for congenital stenosis of the pylorus, nitrous oxide with oxygen is especially suitable. The infant may hold his breath at the first application of the mask so long that he becomes deeply cyanosed, and may even die. This breath holding may be overcome by rubbing the abdomen and giving an extra supply of oxygen with a little ether vapour. Rebreathing lessens the anæsthetic value of nitrous oxide and oxygen. In infants the margin between success and failure with gas is very narrow and much practice is required to ensure success. The gasses should mix close to the patient's mouth and not in the bottom of a rubber bag. Ether must be added in abdominal operations. Too light anæsthesia not only hampers the surgeon but leads to the development of shock.

Dr. A. T. Pitts.—Ethyl chloride is the ideal anæsthetic in the extraction of teeth in children. Two or three minutes of good anæsthesia can be obtained after the mask is removed. Since 1905 it has been administered 25,000 times at the Great Ormond Street Hospital without a fatality.

W. B. Howell

HALIFAX BRANCH OF THE MEDICAL SOCIETY OF NOVA SCOTIA

The evening of January 13th was devoted by the Halifax Branch of the Medical Society of Nova Scotia to the consideration of "Purulent Disease of the Accessory Nasal Sinuses." Dr. H. W. Schwartz contributed the paper, which was a very clear and concise presentation of the principal points for discussion. After dealing briefly with the anatomy, which he illustrated with several very fine specially prepared drawings and a number of excellent moist and dry specimens, Dr. Schwartz considered the physiology of the nose and accessory sinuses, pointing out that the filtration, warming and moistening of air in the nasal passages are very necessary for the protection of the bronchi and lungs. Conditions interfering with the proper performance of these functions are very prone to favour the development of respiratory complications. A common group of symptoms associated with sinus disease, stuffiness and obstruction of the nostrils with or without discharge, is apt to be attributed to adenoids, but adenoids seldom obstruct the breathing of the adult. Such obstruction is commonly due to septal deformities and the changes induced thereby in the surrounding tissues. An ordinary coryza may be regarded as an acute sinusitis, which usually clears up, if drainage is good, under simple medical treatment. If there is interference with drainage, and pus is formed under pressure, surgical interference is required to relieve the symptoms. The patient who complains of frequently recurring attacks of coryza is usually one who has been the subject of an acute sinusitis which did not receive adequate treatment. The more severe conditions were illustrated by a series of case reports; first a number in which the development was acute and then a number of slower developments but with more or less prolonged duration. These cases typified the symptoms occasioned by such involvement of of the sinuses; but frequently more widespread symptoms were manifested, such as mental depression, asthma and chronic bronchitis, which the patient had not suspected to be associated with the sinus involvement. Dr. Schwartz described the treatment adopted in each case, emphasizing the need for thoroughness in the examination in order to be prepared to fully cope with the situation likely to be revealed during the course of operation. In discussing the paper, Drs. MacLennan, Doull, Cunningham, Kirkpat-

rick and Keshen united in complimenting Dr. Schwartz on his highly instructive paper, and drew upon their own experiences to illustrate their comments.

A clinical meeting of the Halifax Branch of the Medical Society of Nova Scotia was held at the Victoria General Hospital on the 27th of January. Dr. Nicholls presented a specimen showing two tears in the œsophagus, caused by swallowing a ragged piece of bone. Patient on admission showed emphysema of subcutaneous tissues of neck and upper chest and died shortly after admission. At the autopsy much pus was found in the mediastinum and in one of the pleural cavities. Dr. MacDougall showed a patient who was convalescing from a recently performed extra-pleural thoraco-plasty. The case was one of chronic pulmonary tuberculosis with much cavitation in the right apex. There had been a great deal of expectoration and frequent flares of temperature. The skiograms showed the effect of the operation in collapsing the lung, and the patient's condition was wonderfully improved. The points to be considered in deciding the indications for operation, and the technique of the operation, were fully outlined. Dr. K. A. MacKenzie presented two recently admitted cases showing auricular flutter: in one the pulse was quite regular, in the other it was irregular. The features which usually permit of a diagnosis of this condition without the aid of the electrocardiograph were emphasized. Dr. MacKenzie also showed a case of splenomegaly with anæmia, in which there was a typical blood picture, with an enlarged spleen and a moderately contracted liver. The treatment will be transfusion followed by splenectomy. Dr. Mack demonstrated a patient who had been in hospital two years previously with symptoms indicating syphilitic involvement of the cord. These symptoms had appeared two years after infection, and improved rapidly under diarsenol. He now complains especially of irritability of the bladder and some dribbling. While the Wassermann test of the blood is negative that of the spinal fluid is positive, and other laboratory reactions indicate involvement of the cord. These together with the uroscopic findings warrant the diagnosis of neurogenous (cord) bladder. In the discussion of the cases a number of members took part and all agreed that the session had been most profitable.

W. H. HATTIE

MONTREAL MEDICO-CHIRURGICAL SOCIETY

At the monthly meeting of the Society held on Friday, February 5 last, Dr. Maude E. Abbott presented the *Sir William Osler Memorial Volume of the International Association of Medical Museums and its Biographies*, with the assistance of lantern slides showing the more important illustrations, pages from each of the seven rubrics into which the classified bibliography is divided, and list of contributors to date. By way of introduction Dr. Abbott said:

Mr. Chairman and Members of the Society: Before entering upon a description of the Memorial Volume which I have the honour to present before you to-night, I would like to make two short introductory statements. First, I would express my sincere thanks to the president and council of this Society for giving me the privilege of bringing this subject before the Montreal Medico-Chirurgical Society, because by this action they have definitely put it on record that they understand that this undertaking is actually a memorial one, carried out under the auspices of another scientific society by volunteer labour, contributions, and advance subscription without the intervention of any commercial agency, and that it is worthy of recognition as such. It is because we are anxious to preserve this character of the work to the end and so bring to our effort the full fruits of its final achievement, that we are seeking now publicity for it within the bounds of the profession and under the best possible ægis, that of the universities and of such a society as this.

It is now nearly six years since the Museums Association, at its annual meeting at Cornell University in April, 1920, decided to bring out its next Bulletin as a Sir William Osler Memorial number, which should be along the lines of a contribution to our knowledge of those early pathological and biological researches which contributed so largely to his later development as a Master of Medicine. This originally modest and limited plan has been extended, through the extraordinarily warm response that was made to our first early appeal for contributions, both of reminiscent articles and funds for its publication, until it has covered all phases of Sir William Osler's many-sided life. The gift of $1,000 from the late Sir Edmund Osler, and a grant of $500 from the National Research Council of Washington, and donations from other generous initial

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contributors, some of whom are in this room tonight, made it incumbent upon us, and indeed an actual point of honour, that we should bring the volume to the highest possible standard. Slowly and silently it has grown with the years, assuming form and shape as the many reminiscent articles, written by warm friends, reverent disciples, and loving friends of Sir William Osler, have come in and grouped themselves in biographical sequence under the five periods of his great career.

But more than this was necessary. All the appreciations and illustrations we could gather would not constitute a volume of permanent value unless linked with the tale of his own achievements as told by his own published works. And so we have held it back for at least two years for the completion of its classified and annotated bio-bibliography. This is at last completed, and meantime our mailing list has been extended until at the present moment it literally belts the world. That this is an international undertaking which has its origin in Canada and at McGill and yet is universally accepted as representative elsewhere, is not the least part of its value and interest to us as Montrealers and Canadians.

The second statement I want to make is the reply to the question: What relation does this volume bear to the great Life of Osler by Dr. Harvey Cushing? The Memorial Volume is neither a rival nor a duplicate, but is a sequel and supplement of immense value. Dr. Cushing's book is the work of a man of genius which tells the story by means of Osler's own letters and articles with an interest which, especially in the second volume, becomes enthralling. In the Memorial Volume we are wandering within the spaces that have been unlocked for us by the details made manifest by Cushing's hand, and are hearing directly from the lips of Osler's associates themselves their thoughts of him; while, in its Bibliographies, we may trace for ourselves the graphic curve of his literary and scientific achievements, which ascends from Natural Science and Original Researches in Comparative Pathology in his youth, to Human Pathology in his early manhood, Clinical Medicine in his prime, Literary, Biographical, Educational, and Bibliographical productivity in his later life, and Public Welfare to the end.

Among others who emphasized the value of this work, Dr. C. F. Martin, Dean of the Medical Faculty, McGill University, referred to the large amount of time and labour that Dr. Abbott had so unselfishly expended on the production of this splendid volume which he had had the pleasure of reading more than once.

He regarded it an extremely important addition to Oslerian literature and to the history of medicine in general. He wished to lay stress, also, on the value of the classified and annotated bibliographies which completed and rounded off the volume and added enormously to its usefulness. The bibliographies not only gave an insight into Osler's versatility and great productivity, but constituted an invaluable source of reference to which the practising physician and research worker might turn, and in which he would find information throwing light upon practically every branch of medicine.

One point of importance had not been fully explained. The list of subscribers to the publication fund printed at the end of the volume was not a mailing list of those buying a copy, but contained only the names of those who had subscribed additional sums to be devoted either to the publication fund itself or towards the purchase of additional copies of the volume which would be supplied to them to the extent of their subscription. He considered that the volume was a great success, reflecting great credit on Montreal and McGill University where the work was being carried out, and he congratulated Dr. Abbott on its completion.

The paper of the evening on "Various Forms of Anæmias" was presented by Dr. F. G. Finley, and will apear in the *Journal* at an early date.

Dr. R. H. Malone read an interesting paper on the present epidemic of rabies in Ontario and Quebec, and Professor W. T. Waugh demonstrated with the aid of the lantern the pathology of urethral caruncle and ganglion.

Abstracts from Current Literature

MEDICINE

Weaknesses in Our Defence Against Disease. Lyster, R. A., *Jour. Royal San. Institute,* Dec., 1925, vol. xlvi, p. 302.

This was a presidential address at a conference of medical officers of health. Dr. Lyster feels from a long experience of teaching and working, that there is a need for constantly setting forth our position in regard to warfare against disease. Not the least reason for this unwearying effort is the fact that false hopes or ideas are apt to arise in people's minds regarding public health. One of our weakest points is the present condition of the medical curriculum, which does not in any sense lay an adequate emphasis on preventive medicine, for the existence of a course in public health does not ensure for the medical student an idea of the importance of public health or the scope of preventive medicine. Reference is made to a chair recently created in Vanderbilt University, Nashville, Tennessee, which aims at developing the "preventive" idea throughout the entire curriculum and Dr. Lyster hopes that something of the sort will be tried in England. It is astonishing that at present there is not in the entire United Kingdom a single teacher who devotes the whole of his time to teaching this important department of medicine.

It is time to look back at the results of certain legislative measures in connection with public health. In 1922 the Sanitary Officers Order was promulgated and gave assurance that in future only specially trained men would be appointed as medical officers of health, but in despite of this order local practitioners are still being allowed to do the work.

The Midwives Act, again, has not brought about the improvement in maternal mortality which was looked for, and this subject is receiving very careful attention.

As regards health in factories severe criticism is made of the lack of unification in health work, which is apparent in the fact that there are three separate ministries of health. The importance of problems connected with health in factories is obvious when it is considered that twelve million of the population spend a third of their lives in factories and workshops.

In the matter of supervision of food the protection of the milk supply is thoroughly unsatisfactory in all respects, and certain legal decisions have made it difficult to appeal to the law in cases of adulteration. Dr. Lyster would advise against any preservatives in food whatsoever, on the ground that not only is the effect of the preservative itself a potential danger, but also, it may serve to mask adulterations and pollutions.

Organized attempts should be made to eliminate the mentally unfit. It is not time yet perhaps for the compulsory health certificate before marriage, but a beginning should be made by means of such a step as making it illegal to marry a defective person. Dr. Lyster refers to the example of commonsense set by other countries. In New Zealand for example, a special committee of inquiry has recommended the authorization of powers in suitable cases to make sterilization a condition of release from the register of mental defectives. This would relieve the enormous congestion of mental defectives detained in institutions. As things are at present Dr. Lyster states that every encouragement is being given to the married regular producer of mentally defective children.

H. E. MacDermot

Cardiac Infarction (coronary thrombosis); An Easily Diagnosable Condition. Christian, H. A., *Amer. Heart Jour.,* Dec., 1925.

Dr. Christian finds that the diagnosis of cardiac infarction resulting from coronary thrombosis, is made with far greater frequency and certainty nowadays, than it was twenty-five years ago. This improvement in diagnostic accuracy has come about chiefly as the result of careful clinical study of patients by those who will take the time and trouble necessary for a thorough history and physical examination. No new or special methods of examination have been used in recognizing this clinical entity, though the electrocardiogram sometimes provides valuable assistance. Much more, perhaps, has been gained by the patient correlation of clinical findings with the results of post mortem examination, and Dr. Christian

protests strongly against the apathy which exists in regard to demanding autopsies, more particularly in private practice.

Considerable importance is attached to the diagnosis of cardiac infarction. Not infrequently the unrecognized case is subjected to a laparotomy on account of pain referred to the abdominal area. To differentiate such pain from angina pectoris is also important, since cervical sympathectomy may be advised for what is thought to be the latter condition, and this operation is contraindicated in infarction. Treatment depends on the early recognition of the condition and a careful planning of the convalescence. There have been at the Peter Bent Brigham Hospital in Dr. Christian's service, during less than ten years, forty-five fatal cases and twenty-five that recovered.

The history may contain accounts of precordial distress ranging from very slight and transitory discomfort, to definite anginal attacks. The pain may be substernal or in the epigastrium. In a large proportion of cases it predominates over the other symptoms; but there is a smaller group without pain. In these there is collapse, a sense of impending dissolution and dyspnœa. In the former group, the pain is most frequently behind the sternum, especially the upper portion. It often radiates, most often down the left arm and along the left side of the neck. It may persist for hours, and patients usually find that no change of posture gives any relief. There is therefore no characteristic attitude, but the appearance of the patients during an attack is one of great suffering.

Gastric symptoms are very commonly noted, and questioning frequently brings out accounts of pain or distress which the patient attributes to indigestion. It is suggested that some of these may really be slighter vascular disturbances in the myocardium; it is also possible that the "acute indigestion" which is frequently given as the diagnosis in cases of sudden death, would not infrequently be found to be a cardiac infarction if careful post mortem examinations were carried out. Dyspnœa is a prominent and very striking symptom; especially, in the disproportion between its degree and the amount of disturbance demonstrable in the heart and lungs. A slight change of position in bed may bring on severe dyspnœa, while the physical signs may simulate an acute abdominal condition.

Weak cardiac action, with perhaps arrhythmia, is an even more constant and important sign. The blood pressure is generally lowered, and its rise to normal is a good prognostic sign. Slight fever and some leucocytosis are almost invariably present. These with the abdominal signs may simulate an acute abdominal condition.

Treatment is best directed towards easing the pain and protecting the heart from the effects of strain. Morphia is unquestionably the most effective drug, and should be given until the pain is eased. Nitroglycerine is of no effect, and is contraindicated by the low blood pressure. Absolute rest in bed is essential, six weeks being the minimum amount before even a very gradual return to physical exertion. The blood pressure is a good guide.

Dr. Christian is against the use of digitalis in these cases, but admits that others recommend it. For cardiac collapse caffeine, intravenously or intramuscularly, seems to him to be most effective: epinephrin may tide over a crises, ¼ c.c of the 1:1000 solution.

H. E. MacDermot

The Value of the Icterus Index in Differentiating Anæmia. St. George, A. V. and Brown, A. Lincoln, *Arch. Int. Med.*, Dec., 1925.

Realizing the pitfalls which often beset one in attempting to diagnose the various anæmias, the authors carried out a series of observations, using the icterus index. They interested themselves primarily with a clinical fact, namely the intensity of the yellow colour of the blood serum, and did not concern themselves particularly with the numerous considerations as to the possible sources of this colour.

Their series of clinical cases consisted of twenty-three cases of pernicious anæmia, twenty-three cases of carcinoma with anæmia, fourteen examples of secondary anæmia, and eighteen conditions other than pernicious anæmia giving a high index.

The simplest and most rapid means of determining the icterus index was used. They used a modification of Meulengracht's bilirubin colorimeter. This consisted in having the same standard solution as he had for an index of I and having a series of permanent standards of greater intensity in order to make the colour

comparison directly. This did away with the necessity of diluting the specimen to be tested.

By the above method carried out on 120 consecutive controls, it was found that the average index was 4.41 and secondly, that 90.8 per cent of the control cases had an index between 3.5 and 5.5 inclusive. Similar figures were obtained by Van den Bergh. In the uncomplicated cases of pernicious anæmia the colour index showed a range well above the normal variation. The range varied from 9 to 12.5, with an average index of 9.7. This was in accord with the findings of other investigators.

By complicated cases, were meant those in which some factor other than hæmolytic anæmia was at work to give a high icterus index. Such factors were, cardiac insufficiency, co-existing pneumonia, and chronic sepsis, especially of the biliary system.

In order to clear up the question as to whether a high index in any particular case was due to hæmolytic anæmia or to hepatic obstruction the Van den Bergh test was performed. A direct test was considered to prove the pressure of hepatic obstruction. No constant relationship was noted between the height of the index and the severity of the anæmia. However, the index did seem to rise during or even before a bone marrow crisis. This suggested to the authors a clinical means of determining when it would be advisable to transfuse a patient. In the cases of carcinoma with anæmia and in the uncomplicated secondary anæmias the icterus index was invariably at or below the normal range.

They also found that a factor which may lower the index below the usual for the disease in question was hæmorrhage, especially a constant slow bleeding (oozing) such as occurs in gastro-intestinal new growths.

The above findings would suggest that uncomplicated cases of pernicious anæmia, and the severe anæmia simulating it in cases of carcinoma may be readily differentiated by the icterus index. In the former the index would be consistently over normal, and in the latter below the normal range. The writers state, however, that diagnosis of pernicious anæmia is not to be made merely because of the presence of a high icterus index with more or less marked anæmia. There are numerous conditions which do show a high icterus index but these can usually be differentiated by the history, clinical examination, or the additional information supplied by the Van den Bergh reaction.

L. C. MONTGOMERY

SURGERY

Tumours of the Urachus. Rankin, Fred. W. and Parker, Bennett, *Surg., Gyn. and Obst.*, January, 1926.

Benign pathological conditions of the urachus are not uncommon, but malignant tumours are seldom met with and are mentioned infrequently in the literature. A large percentage of all pathological conditions of this structure occur in its lower half. The urachus remains patent until the third month of fœtal life, at which time it becomes obliterated, forming a fibrous cord. The obliteration occurs irregularly, so that small areas remain, and if these persist, probably give rise to many of the urachal cysts. The canal is lined with epithelium of the bladder type; the wall has a circular and longitudinal muscular layer.

Many people go through life with a patent urachus, and only when urinary obstruction takes place does it become evident. Cases are on record where cystitis has been set up, the patent urachus being the avenue of infection.

Large cysts, infected cysts, cysts with fistulæ or neoplastic change, are the only ones for surgical consideration. The largest known cyst reported was Rippman's case ((Cullen). It contained 52 litres. These cysts may be pedunculated. When abscess, the result of infection, takes place, the patient becomes acutely ill with severe abdominal symptoms associated with chills and fever. In Powell's case of a child, age nine months, there was blood and pus passed in the urine. Eastman reports two cases of tuberculosis of the urachus. In the cases of tuberculosis of the urachus. The authors report two cases of benign tumours, one fibroma and one adenoma. In the case of the adenoma the first symptom of serious import was blood in the urine. This is undoubtedly a life-saving event in the development of this type of tumour, as warning is given while the case is still operable.

Two cases of squamous-celled epithelioma and one of adeno-carcinoma are reported. The history in each case extended over a considerable period.

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Metastases occur late and the spread is usually by direct extension. R. V. B. SHIER

Cancer of the Colon. Pannett, Chas. A., *Brit. M. J.*, Jan. 2, 1926.

Surgical therapy offers a very great deal in cases of malignant disease of the colon. The difficulties of early diagnosis are many. Recurrent attacks of abdominal pain with a history of gradually increasing constipation need careful investigation. Patients often complain of the pain after taking food, due to exciting peristalsis. Desire to have a bowel movement after each meal, and the excessive pain induced by aperients are very suspicious symptoms. Between attacks little can be felt, but during a seizure the cæcum, distended with gas, alternately contracting and relaxing, can be felt. A definite tumour is felt in 40 per cent of cases, and is very often due to impacted fæces above the carcinoma. This tumour disappears with a successful enema. The commonest site of cancer is in the sigmoid loop. The above picture is typical of the symptoms in a case of encircling scirrhus carcinoma, but there is a fungating cauliflower type. These do not as a rule produce obstruction but diarrhœa, and are prone to infection and sooner or later induce cachexia and fever.

Moynihan states that right colon cancer gives diarrhœa and left constipation, but Pannett points out the fact that diarrhœa may alternate with constipation in left-sided cancer.

The following clinical classification is given: (1) Those suffering from only vague abdominal symptoms, especially short-lived attacks of pain. (2) Those suffering from chronic obstruction. (3) Those suffering from acute obstruction. (4) Those suffering from cachexia with irregular fever and diarrhœa.

The author regards x-ray pictures of the colon as valuable but not absolutely diagnostic in all cases. Sigmoidoscopy should always be carried out.

The surgical treatment, provided the liver is free from metastases, depends on whether or not obstruction exists. In non-obstructed cases a one-stage operation with excision of the segment with its gland-bearing area, is done. In obstructed cases there is strict adherence to the rule that a two-stage operation is imperative; the first stage to relieve obstruction and provide drainage by cæcostomy. The only exception to this is in cancer of the cæcum, where resection and end-to-end anastomosis of the ileum and transverse colon may be done. Sometimes a cæcostomy in cases of cancer at the splenic flexure does not drain the colon, and a transverse colostomy is preferable. If a preliminary cæcostomy has been done in a case of hepatic flexure carcinoma, it is advisable at the second operation to excise the cæcostomy with the cæcum, terminal ileum, and colon, and thus get beyond the limits of the growth.

In describing his technique the author stresses the fact that in doing an end-to-end anastomosis of large bowel, it is very important not to have the mesenteric attachments directly opposed when the suturing is done, but to have some axial rotation of one segment. In this way leaking is prevented.

R. V. B. SHIER

Effect of Magnesium Sulphate on the Cerebrospinal Fluid Pressure, and on the Brain Volume. Morrissey, E. J., *Arch. of Surg.*, Nov., 1925.

The author refers to Weed and McKibben's work in 1919, on the reduction of cerebrospinal fluid pressure by intravenous injections of electrolytes. In 1920, however, Foley and Putnam advocated administration by the mouth so as to avoid the circulatory and respiratory disturbances sometimes produced by intravenous administration, and in 1923, Fay advised the use of magnesium sulphate as being the most effective salt, because it is not absorbed, and causes the outpouring of more fluid into the intestinal tract than does the sodium salt.

Dr. Morrissey states, however, that in the neuro-surgical service of the Medical College of Virginia, where the yearly average of acute cranial injuries is about 125, the oral administration of magnesium sulphate has not given the good results elsewhere reported. He gives details of experiments in five cases upon whom spinal puncture was performed either for syphilitic treatment or diagnostic purposes. The administration of 45 grammes of magnesium sulphate in these cases produced no appreciable fall in pressure, as measured by a manometer, even throughout a period of two hours. With the administration of sodium chloride under similar conditions, however,

there was a fall in pressure within ten minutes, and at the end of eighteen minutes it had fallen 4 mm. of Hg., at which level it remained for thirty minutes.

He concludes that the fall in pressure described by Fay was caused by the handling of the intestines of the animals used in experimentation. Magnesium sulphate, apparently, only dehydrates brain tissue to the same extent that it does any similar bulk of body tissue, and cannot be relied on to relieve intracranial pressure when used in doses suitable for clinical use. Sodium chloride, on the other hand, given intravenously in hypertonic solution, has an effective action on intracranial pressure, without depressing blood pressure or the bodily functions as a whole.

No one method should be relied on: the best results will be obtained by a judicious choice or combination of hypertonic sodium chloride solution, repeated spinal punctures with withdrawal of fluid, and subtemporal decompression. H. M. ELDER

Why Does not the Thoracic Surgeon Cure Cancer of the Œsophagus? Jackson, Chevalier, *Arch. Surg.*, Jan., 1926.

Dr. Jackson points out that cancer of the œsophagus is not a rare disease, and that it usually is also a mild, slow and for a long time a purely local process, thus rendering it an ideal condition for surgical cure. The answer to his question therefore is to be sought in the diagnostic methods employed. Some of the faults noted in these are: (1) The fact that the finding is always negative in the early stages. (2) That the information is gained by inference, not objectively. (3) That there should be such dependence on the fact of obstruction. In a loose, resilient tube like the œsophagus, it is only the well advanced cancer that will cause a marked degree of obstruction, and sloughing cancers are sometimes not obstructive at all.

And yet early diagnosis is essential for the additional reason that the patient is faced with a major operation.

Early and positive diagnosis can only be made in two ways: by rœntgen-ray examination, and œsophagoscopy. Dr. Jackson reminds us that he has urged the early use of the œsophagoscope for the last thirty years, and he does not think it has been given the prominence in the text-books which it should receive. This may be partly because its use is a highly technical procedure, and too often it is used by those unfamiliar with it, however skilful they may be otherwise. The result may be fatal, and the instrument is discredited. In the hands of a trained man, however, it is claimed that a diagnosis can be made of endo-œsophageal cancer no larger than a cherry pit, and with as much certainty as does a gynæcologist recognize cancer of the cervix. The method allows of a specimen being taken for histological study. It is to be remembered that the instrument only gives this early certainty of diagnosis in endo-œsophageal cancer: in peri-œsophageal cancer positive results are not obtainable so early, but this form is hopeless.

Dr. Jackson has gathered the results of œsophagoscopy from seventy-eight trained observers: in 1269 cases of cancer of the œsophagus, a correct diagnosis was made in 92 per cent, incorrect in three per cent, and inconclusive in five per cent. H. E. MACDERMOT

ANÆSTHETIC

A Lecture on Respiration in Anæsthesia and its Control by Carbon Dioxide. Henderson, Yandell, *Brit. M. J.*, Dec. 19, 1925, p. 1170.

The practical problems of anæsthesia are uniformity of administration, rapid induction and termination, prevention of acapnia and anoxæmia, and the preservation of the patient's vitality. To obtain these ends many different types of apparatus have been invented within the past few years. They are designed to enable the anæsthetist to administer nitrous-oxide, ether, ethylene, sometimes even acetylene and other new anæsthetics in sequence or in combination with oxygen, and combined with any percentage of carbon dioxide. By means of one or more bags, the advantage of rebreathing expired air, with its increased percentage of carbon dioxide, is obtained. The lungs themselves are a rebreathing apparatus, especially fitted by nature to prevent entirely fresh air from coming in contact with the blood as it passes through the pulmonary vessels. Nature has arranged that the lungs constantly contain 3 to 5 litres or more of air, with a carbon dioxide content of about 5 per cent. Only one-tenth of this amount is thrown off at each respiratory tide. This fraction is replaced by

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the same amount of fresh air and immediately mixed with the stationary air, so that the composition of the air in the lungs normally varies in its oxygen and carbon dioxide content by only two- or three-tenths of one per cent. By following the lead of nature in this regard anæsthetists have found that the addition of a rebreathing bag of 4 or 5 litres capacity, to the volume of stationary air is advantageous. The total content of lungs and bags is thus about 8 litres and the variation in the composition of the air is still further reduced; the carbon dioxide is conserved, but oxygen from a cylinder must be fed into the bag instead of atmospheric air.

To maintain anæsthesia evenly and intelligently an apparatus should be employed which has a device for measuring the flow of oxygen, and for indicating the volume of the respiratory tide per minute. The ether should be given volatilized at a distance from the patient's face, so that the anæsthetist can feed its vapour into the mask or into the rebreathing bag. The important addition to these mechanisms is a cylinder containing a mixture of oxygen and carbon dioxide in which the amount of the dioxide may vary from 5 to 25 per cent. Professor Henderson at first recommended only 5 per cent, but in practice larger amounts afford a more complete control of the depth of the respiratory tide. It is not used straight but is added to the air in the bag or to oxygen from another cylinder. Used thus it secures any desired degree of stimulation and enables the anæsthetist to exercise a complete control over the respiratory act. By this means the stage of induction may be rendered so short that full anæsthesia is obtained very promptly. When the anæsthetic is stopped, an increased amount of carbon dioxide is given to deepen the respiration and thus hasten elimination of the anæsthetic. Henderson has been greatly struck by the difference between the patients' appearance when anæsthetized in this way and that seen when the open method is used.

The sole condition necessary for full surgical anæsthesia is the concentration of the ether in the brain. Owing to the free circulation through the brain this concentration of ether in the nerve centres becomes rapidly the same as that in the arterial blood. The volume of blood flowing through the lungs is equal to the volume of air breathed during any given period of time. Owing to the amount of dead space in the pulmonary passages only two-thirds of the air breathed ordinarily reaches the lungs. In order to induce full anæsthesia within two or three minutes with no more than normal breathing, the concentration of the ether vapour inhaled would have to be extremely high. This would, however, have a very irritating effect on the lungs, especially when the vapour is very cold. Quick induction without irritation of the lungs can best be obtained by increasing the volume of air breathed, and this is quickest accomplished by the use of carbon dioxide as above described.

This method of employing carbon dioxide and oxygen is also of great practical use not only in anæsthesia but in all forms of asphyxia; and its administration tends to prevent the pneumonia which so often follows recovery from anæsthesia and asphyxia.

W. B. Howell

Non-Volatile Aliphatic Compounds in General Anæsthesia. Lambert, R. K., *The Lancet*, Jan. 16, 1926, p. 121.

Various aliphatic compounds have been used during recent years in the anæsthetization of animals for experiments. If they could be used for human beings an anæsthetic might be obtained which had none of the disadvantages of chloroform and ether. The most important groups of these compounds are the halogen derivatives of aldehydes and ketones (chloral, etc.), the derivations of carbonic acid (urethane, etc.), and the higher alcohols (isopral, etc.).

Excellent results have been obtained in animals with a combination of isopral and hedonal. Isopral is readily absorbed by the mucous membranes and when given subcutaneously. Its action, which begins almost immediately, affects the bulb, the spinal cord, and the sympathetic system as well as the brain. Toxic doses affect the respiratory centre before the heart.

Hedonal is absorbed very slowly. The sleep it produces closely resembles natural sleep. Two parts by weight of isopral to one of hedonal given intramuscularly causes a rapidly developing narcosis. A series of laparotomies was performed upon cats under ether, after a sufficient dose of isopral-hedonal had been given. The

degree of anæsthesia and the level of blood pressure remained strikingly uniform with doses of 10 to 15 c.cm. of ether, despite numerous shock producing manipulations. Post-operation sleep lasted several hours. The administration of these drugs for the purpose of obtaining anæsthesia in man is being attempted at University College Hospital. W. B. HOWELL

PAEDIATRICS

The Use of Ether in Pertussis. Goldbloom, A., *Jour. Amer. Med. Assoc.*, Nov. 23, 1925.

During the past five years a number of writers have testified to the value of intramuscular injections of ether in pertussis. The number and severity of paroxysms are reduced, sleep and appetite are improved and vomiting is lessened. The technique generally consists of injecting 1 to 2 c.c. of ordinary sulphuric ether into the gluteal region either daily or on alternate days. The results are often very striking after three or four injections, but these are momentarily very painful and are occasionally followed by necrosis at the site of injection. To obviate these two objections Dr. Goldbloom decided to try giving the ether per rectum. One dram of ether is dissolved in one ounce of olive oil and of this one tablespoonful is injected into the rectum twice daily. Within twenty minutes ether can be detected in the breath and it continues to be exhaled for four to six hours, showing that it is absorbed from the rectum and excreted by the pulmonary alveoli. In this way a sedative action is exerted on the bronchial tree. Details of the results are cited, which show that this method of treatment is of great benefit in most cases of whooping cough, particularly when the paroxysmal stage is well established. L. M. LINDSAY

DERMATOLOGY

The Treatment of Human Anthrax. Pifper, Adrianus, *Lancet*, Jan. 9, 1926.

This is a plea for the use of salvarsan in the treatment of anthrax — cutaneous and pulmonary. Though the theoretical foundation is lacking, the author states that the drug has never failed him in treating this disease. Human anthrax is gradually disappearing and practitioners acquire, with difficulty, firsthand knowledge of it. The mortality varies, but is far from negligible.

The diagnosis of early pulmonary anthrax is particularly difficult. The text-book pictures represent late stages. The early stages do not suggest anything like the "malignant pustule." Very extensive œdema, surrounding a comparatively small central lesion, suggests anthrax. This should be confirmed bacteriologically, when possible. Evidence such as occupation, a new shaving brush, or dealings with dead cattle, should be sought.

Treatment by incision is useless. Mild disinfectant soaks are advised, with rest in bed to avoid a septicæmia. Specific serum treatment has a place, but is seldom available for the practitioner.

The salvarsan treatment has been well tried in the Pretoria Hospital since 1921. In over forty consecutive cases there have been no fatal results. None of these were pulmonary. Some of the skin cases were very severe and two seemed moribund on admission. One careless youthful worker in the laboratory, developed a very virulent sore on the lip, with septicæmia. A few neosalvarsan injections saved him. As a result the Public Health Department of South Africa advised this as a routine treatment. None of the recent fatal cases received the salvarsan treatment.

The routine is.—Bacteriological examination of nasal smears and examination of sore, preferably the vesicles. Frequently one can approach certainty in diagnosis in a few minutes. Doubtful cases are cultured. Neosalvarsan .75 grm. (average) is then given intravenously. Large doses are well borne. Rest in bed is advised and mild antiseptic compressers. After two or three injections the œdema is improved. The temperature drops to normal in about six days, the necrotic part drops off and the result is a surprisingly small scar. C. R. BOURNE

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Association Notes

THE VICTORIA MEETING

In the February issue, we published in detail suggestions from our two railway systems for special trains to and from the annual meeting to be held in Victoria, B.C., during the week of June 21st next. Emphasis was laid upon the fact that a special train could not be arranged for unless at least one hundred passengers desired it. Our responses to date are as follows:—

Nineteen persons have indicated their desire to travel on a special train. Five of the above number have suggested going one line and returning the other.

N.B. Unless the required number, that is, at least one hundred, manifest a desire, at an early date, to travel by special train, the idea will be dropped. If you are interested, please write the General Secretary at once.

Programme

The Central Programme Committee has pleasure in announcing that arrangements have been completed for the following members of the profession to address the annual meeting:—

Dr. Edgar Allin, Edmonton, Alta.—"Surgical aspects of acute abdominal disease."

Dr. L. J. Austin, Kingston, Ont.—"Injuries to the elbow in children."

Dr. F. G. Banting, Toronto—Medical Research.

Dr. J. F. Barnhill, Hollywood, Cal.—Subject to be announced later.

Dr. Gordon Chown, Winnipeg, Man.—"Errors in diagnosis, with reference to diseases of infants."

Dr. W. H. Dickson, Toronto—"Symposium: Duodenal ulcer—radiological aspect."

Dr. G. S. Fahrni, Winnipeg, Man.—"Symposium: Goitre—surgical aspect."

Dr. J. G. FitzGerald, Toronto—"The etiology, diagnosis, prevention and treatment of scarlet fever."

Dr. A. H. Gordon, Montreal—"Symposium: Goitre—medical aspect."

Dr. Alex. Gibson, Winnipeg—"Acute arthritis."

Dr. Duncan Graham, Toronto—"Pernicious anæmia."

Dr. A. J. Grant, London—"Chronic mastitis."

Dr. V. E. Henderson, Toronto—"The newer drugs, their uses and abuses."

Dr. W. B. Hendry, Toronto—"The toxæmias of pregnancy."

Dr. H. W. Hill, Vancouver—"The non-relation of mal-nutrition to the incidents of infectious diseases."

Dr. Charles Hunter, Winnipeg—"Encephalitis lethargica."

Dr. W. D. Keith, Vancouver—"Symposium: Goitre—from the standpoint of prevention."

Dr. Charles F. Martin, Montreal—"High blood pressure from the standpoint of the general practitioner."

Dr. J. C. Meakins, Montreal—"Some phase of heart disease with special reference to the needs of the general practitioner."

Dr. H. C. Moffitt, San Francisco—"Symposium: Duodenal ulcer—medical aspect."

Dr. James Miller, Kingston—The present position of the Cancer Problem.

Dr. J. G. MacDougall, Halifax—"Empyema."

Dr. J. S. MacEachern, Calgary—"Prevention, diagnosis and treatment of post-operative peritonitis."

Dr. W. H. McGuffin, Calgary—"Symposium: Goitre—radiological aspect."

Dr. Helen MacMurchy, Ottawa—"Maternal mortality."

Dr. J. A. Nutter, Montreal—"Paralytic deformities of childhood."

Dr. L. G. Rowntree, Mayo Clinic, Rochester—"Some phases of renal function."

Dr. F. N. G. Starr, Toronto—"Symposium: Duodenal ulcer—surgical aspect."

Accommodation

Members are reminded that the Empress Hotel, Victoria, B.C., has been secured for our place of meeting and for general headquarters for the convention; and Victoria in June is simply delightful. No doubt there will be a large attendance. It is suggested that members make their hotel reservations early, by communicating directly with the Empress Hotel, Victoria, B. B.

T. C. ROUTLEY

Victoria, B.C., has been wisely chosen as the convention city for the 1926 meeting of the Canadian Medical Association.

Victoria has enjoyed for some years a reputa-

tion as the ideal convention city, and it is the intention of the local membership in Victoria to send all visiting members home with the assurance that they may return soon again to Victoria and Vancouver Island.

The Canadian Medical Association meeting and programme promises to be of high order. The meeting will prove attractive to every member, who wishes to learn the best that is new in all branches of medicine.

When one describes Victoria as an ideal convention city he places programme first, but then thinks of the wonderful setting. What has Victoria to offer the visiting profession? In the first place the meetings are to be held at the Empress Hotel (which is one of the most beautiful of the C. P. R. hotels) and that conveys a picture to the traveller of the comfort and service we are to enjoy. The Empress Hotel Management has placed at the disposal of the Association the large Rotunda, the Palm Room, the Ball Room for the meetings; the series of private dining rooms for the Council meetings and offices, the Ladies' Writing and Sitting Room for the ladies—in fact they have turned over the Hotel to the meetings. This whole arrangement is ideal. The space for exhibits is unexcelled and should prove very gratifying to the firms who wish to participate. To secure accommodation at the Empress Hotel will be ideal and this is one meeting place where the hotel reservations will be a vital feature. The Committee on Hotels and Housing will announce its arrangements early.

Victoria offers to the tired practitioner a haven of rest. Do not book an about-turn ticket—plan your vacation to allow of a stay in Victoria and a possible trip up the Vancouver Island Highway. Do not come away without your golf clubs (five golf courses)—your bathing suit (especially the ladies!)—your fishing rods and tackle and your own tennis racket if you prefer it.

Victoria plays golf the year round and its June weather is perfect. The thermometer will stand at about seventy in the fourth week in June—just warm and pleasant weather—no sweltering heat and dust—no mosquitoes—few flies—but no rattlesnakes—(St. Patrick must have visited Vancouver Island as it possesses no poisonous snakes) and there are no skunks.

Those who wish to bring automobiles will find miles of paved streets and roads and well surfaced country roads. The prairie cars may cross the Rocky Mountains and on to the coast on good roads if members so desire. The Island Highway is a wonderful drive and may be done in comfort over good roads.

The members are invited and urged to make this their real holiday trip.

More details of the things one may do will be given later.

It is not true that Victoria depends on its fully stocked government liquor stores for its appeal. It depends on its wonderful setting—its climate and its people for its popularity as a convention city.

M. W. Thomas,
Local Secretary, C.M.A.

Atypical Tabes Dorsalis. — A. E. Bennett (*Amer. Journ. Med. Sci.*, October, 1925, p. 538) calls attention to the incomplete or atypical (*forme fruste*) type of tabes dorsalis which in gastric crises sometimes leads to errors in diagnosis and the performance of unnecessary abdominal operations. The chief sources of error appear to be that cases with crises are usually not typical; that examinations are incomplete with failure to realize that the root pains of cerebro-spinal syphilis may simulate almost any abdominal lesion; and that the spinal fluid is not examined with sufficient frequency. In most cases spinal fluid examination will settle the diagnosis. Notes of a case are given in which five major abdominal operations had been performed in various hospitals without relief until a bilateral chordotomy for section of the antero-lateral columns was performed. Gastric crises occur in from 10 to 20 per cent of all cases of tabes dorsalis, and reliable reports indicate that needless operations are performed at least once through mistaken diagnosis in more than 10 per cent. In approximately half the early cases the classical signs of tabes may be absent when abdominal pains are present. The knee-jerks are normal or increased in at least 25 per cent of early cases, and about 10 per cent remain atypical throughout the course of the disease.

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Obituaries

Dr. James Third.—After an illness which began in March, 1921, Dr. James Third died at his home in Kingston, December 19, 1925.

Dr. Third was born March 13, 1865, at Campbellford, Ontario, where he received his early education. In 1891 he graduated in medicine with the gold medal from Trinity University. Later he graduated also from Toronto University. Following graduation he served as house physician at the Toronto General Hospital for one year. Then he entered upon general practice at Trenton, Ontario, where he remained for four years. From 1892 to 1896 he was Medical Superintendent of the Kingston General Hospital, where his services were much appreciated. It was due to his effort and enterprise during this period that the first x-ray equipment in Canada was installed in this hospital. In 1897 he retired from the hospital to resume general practice in the City of Kingston. He became a member of the Faculty of Medicine in Queen's University in 1897 and for many years, till he retired in 1919, was head of the department of medicine. In the latter part of his career his work was limited to consultations. He was an examiner for both the Ontario College of Physicians and Surgeons, and the Medical Council of Canada.

DR. JAMES THIRD

Dr. Third was long recognized as a leader in his profession, in the front rank as a practitioner, as a consultant and as a teacher. Of a kindly and affectionate disposition he endeared himself to all who came in contact with him. His patients learned to confide in and depend upon him and came from long distances to secure his attention. He always sacrificed himself to the service of his people. He was a member and regular attendant at the Ontario Medical Association and the Canadian Medical Association where he usually had something to say that was heard with interest and profit by his fellow practitioners. He frequently visited Great Britain and Europe for purposes of study, and was intimate with such leaders as Osler and MacKenzie. The great hospitals and clinics of France and Germany were well known to him. In these and other respects he was always a model for the young graduate who is ambitious and anxious to take a high place in modern scientific medicine. No physician ever enjoyed a greater degree of confidence and respect from the whole community where he spent his life. His prolonged illness was borne with great fortitude and courage. The sympathy of all who knew him is generously tendered to Mrs. Third and to his devoted son, Dr. Reginald. The whole world is richer and better for the life of James Third.

Dr. William J. Boynton,, of Sutton West, Ontario, died in Chatham township on February the 6th. A graduate of Trinity Dr. Boynton had been practicing for the last twenty-five years.

Dr. Lewis Hamilton Evans, a practitioner in Toronto for many years died at his home in Toronto on February the 1st. A graduate of the University of Toronto and of Trinity Medical College Dr. Evans had practiced in Toronto since the time of his graduation.

Dr. Dennistoun Jones of de Pas, Manitoba, died suddenly at Dauphin on Jan 20th. He was a son of the late well-remembered and well-beloved Dr. J. R. Jones, and received his education at Cambridge and the London Hospital. During the war Dr. Dennistoun Jones joined the C.A.M.C. and at its close returned to Manitoba. He leaves a wife and two children.

Dr. Allan Noxon of Toronto, died at the residence of his daughter on January the 24th. Dr. Noxon was born at Bloomfield, Prince Edward County, and came to Toronto forty years ago and has continued his practice in the city since that time.

Dr. Charles Rudolph Paradis, an eminent Regina physician, prominent in social and sporting circles, was visiting his mother in his old home in Rimouski when he died suddenly on January 6th. Dr. Paradis was born in Chicago. He was sent to Quebec for his preliminary education in the seminary of that city. He afterwards obtained his medical education at Laval University and studied for some time in Paris serving as an interne physician at the Necker Hospital in that city. In 1912 he left his Quebec home, and went west to Saskatchewan. finally settling in Regina. His chief sporting interests were hockey and boxing; he was connected with practically every hockey club in the city of Regina, and was associated with many other clubs in that city. Archbishop Mathieu paid a glowing tribute to the work which Dr. Paradis had done in Regina, and said he regarded his death as a distinct loss to the whole community. He was much respected by all the profession in Regina and in the west generally. His death appears to have been quite sudden as he was on his way to Europe where he proposed to take a few weeks rest in France and the south.

Dr. John Burritt Mann.—It was, indeed, a shock to his associates and his friends both in and out of the profession when they learned of the tragic death of Dr. J. B. Mann and his wife near Brockville on the night of September 25, 1925. Dr. Mann with his wife

DR. JOHN BURRITT MANN

had gone away for a short vacation and were staying with friends at their summer cottage on the St. Lawrence. During the night, soon after their arrival, fire broke out in the building and both the doctor and his wife lost their lives as a result.

Such in brief was the sudden and tragic passing of one who was known and beloved by a very wide circle of friends and patients in the Midland district of Ontario.

Dr. Mann was born of United Empire Loyalist stock, on the old homestead at Chemong a few miles out of Peterborough in the year 1885, and here he spent his childhood. He was educated in the Peterborough Collegiate Institute, Woodstock College and McMaster University. Subsequently, he studied medicine at Toronto University from which he graduated in 1909; he then secured an interneship in St. Vincent's Hospital in New York where he worked and studied until 1911, when he began the practice of his profession in this city. In 1920 he associated himself with other members of the profession in Peterborough in forming the Standard Medical and Surgical Clinic, of which institution he remained an active and highly valued member until his untimely death.

In religion a Baptist, he had for some years been an active member, and an official in Murray Street Baptist Church.

His keen desire to constantly widen and deepen his own knowledge of medicine made him an ardent supporter of organized medicine in any form that would lead to the betterment of the profession at large. Hence we find him for years one of the most active minds in the local medical society. being, a few years ago, its valued president. While unable to take an active part in the management of the larger medical organizations of the country, we still find him a member of, and a frequent visitor at the meetings of the Ontario Medical Association and the Canadian Medical Association. He was also a member of the Toronto Academy of Medicine and the Harvey Club of London, Ont. Latterly he devoted himself almost entirely to internal medicine, taking special interest in metabolic diseases, and was fast gathering about him an ever-widening circle of grateful patients and sincere friends.

Having been associated with the late physician for a number of years, I can speak only in the highest terms of his earnestness in and his devotion to the work which he had chosen. His short life was essentially one of service mingled with a great love and thoughtfulness for those directly dependent upon him. Of a buoyant disposition, his outlook on life was always bright and cheerful. Wherever he went, among his patients, he unconsciously imparted to them that splendid hopefulness which he himself enjoyed in such a large measure. Such physicians and such friends we can ill afford to lose, but the summons comes and one by one we join the ever-moving caravan over the horizon of time into the mystery of the world beyond.

We can not close this short note without reference to the death of Mrs. Mann. Seldom in our memory does such a tragedy occur. In a more than usual degree their lives were bound together with a splendid spirit of comradeship. Seldom were they separated during their hours of leisure and so in death we find them still united.

J. STEWART CAMERON

Dr. R. H. Love, who was born at Carleton Place, Ontario, in 1876, had been a resident of Saskatoon for over fifteen years. He was in the act of dressing when he was stricken; medical aid was summoned immediately, but at 11 o'clock the sufferer became unconscious, and did not regain consciousness before death.

Dr. Love graduated from McGill University with the degree in medicine in 1899, and took up his practice in Thompson, North Dakota, where he remained for a number of years. Leaving Thompson, N.D., the doctor came to Viscount, Sask., where he practiced until coming to Saskatoon in 1910.

Dr. Ralph Owen Shatford, of Londonderry, N.S., died of pneumonia on the fourth of February, at the age of forty-three years. Dr. Shatford graduated at Dalhousie in 1908, and located at Londonderry a few years later, where he soon won the confidence and esteem of a large clientele. He took much interest in public matters, and a few months ago was returned to the municipal council, in which he had already served a term, by acclamation. He leaves a widow and six children.

Dr. W. J. Sterling, V.S., dairy inspector died in Kitchener on January the 21st in his sixty-first year.

Dr. A. B. Stewart, of Rosthern, one of the pioneers in the west, died recently. At one time he is said to have been the only medical man between Prince Albert and Fort Qu'Appelle. He was born in Ontario, and was the son of the Rev. J. S. Stewart, who came out to Canada in the early years of last century, and was said to have been the first Presbyterian minister in Ontario. After studying in the medical faculties of Iowa, Toronto and Montreal, Dr. Stewart settled in Rosthern where he became the official doctor for the Indians but had a wide practice among the numerous settlers in that district on the Duck Lake Reserve. He was elected president of the North West Territories

Medical Council in 1895. He was the owner of a remarkable collection of souvenirs from the Riel Rebellion. He is survived by one sister with whom he resided in Rosthern.

Dr. Harry J. Watson.—The many friends of the late Dr. Harry J. Watson deeply regret his death which occurred on January 13th. Dr. Watson graduated at Trinity Medical College in 1889, Toronto, took post-graduate work in England and afterwards practiced at Ottumwa, Iowa. During the Spanish-American War he was attached to the U. S. A. Medical Corps and served with distinction in the Phillipines Corps U.S.A. He took the final year in medicine over at the Manitoba Medical College in 1904 and has practiced in Winnipeg since that time. In addition to his pritvate practice he has been Chief Medical Officer for many years at the American Immigration Bureau, Winnipeg. Enlisting with the C.A.M.C. in January, 1916, he went overseas as Medical Officer with the 144th Battalion. Owing to indifferent health he returned to Canada and resigned in December, 1917. Though far from well his spirit would not be denied, and he again enlisted with the Medical Corps U.S.A., January, 1918, with rank of major and served to the end of the war. In 1907 he married Miss Agnes A. Griffith of Toronto and is survived by his wife and two daughters. Dr. Watson belonged to the Masonic order and to the Scottish Rite and in addition took a very keen interest in the Order of De Molay.

Medical News from the British Empire

GREAT BRITAIN

WOMEN PHYSICIANS ADMITTED TO ROYAL COLLEGE OF SURGEONS

Thirteen British women have received the vote in one of the most autocratic institutions in the world, the Royal College of Surgeons. These thirteen are already fellows and members of the college, but without corporate rights. It has now been decided to permit them to vote for the all-powerful council and to make them eligible to that body.

News Items

NOVA SCOTIA

Dr. T. B. Acker has been appointed to the visiting staff of the Halifax Children's Hospital.

Dr. H. K. MacDonald, of Halifax, has been appointed consultant in Surgery to the Nova Scotia Sanatorium, Kentville.

Dr. Charles S. Morton, of Halifax, has been elected a director of the Ontario Equitable Life and Accident Insurance Company.

Dr. John Stewart, of Halifax, recently accepted a special invitation to address the students of Mount Allison University on the work of Lord Lister.

Members of the Osler Club of Halifax met as the guests of Dr. J. G. MacDougall on the thirteenth of January, when Dr. MacDougall presented an exceedingly interesting paper on the life and work of Ambroise Parè.

The profession throughout Nova Scotia are greatly interested in the announcement of the marriage of one of its most popular and esteemed members, Dr. W. B. Moore, of Kentville, to Miss Eva Belle Borden. The marriage took place at West Roxbury, Mass., on the 27th of January. Dr. and Mrs. Moore will have the best wishes of a very large circle of admiring friends.

As a result of the mayorality election in Nova Scotia towns we note that Dr. H. B. Havey, of Stewiacke, Dr. W. R. Dunbar, of Truro, Dr. S. G. MacKenzie, of Westville and Dr. O. B. Keddy, of Windsor have been selected to fill the office of chief magistrate in their respective towns.

Vital statistics of Nova Scotia for September, 1925, are now reported by the Department of Public Health. Births numbered 934 and deaths numbered 423, as compared with 965 births and 489 deaths in September 1924. The infant mortality rate was 67.4—scarcely more than half that of the corresponding month of the previous year.

At the annual meeting of the Halifax Branch of the Victorian Order of Nurses held in January, the reports showed a large amount of splendid work accomplished by this invaluable organization. Despite the depression in business circles and the consequent difficulty of obtaining financial support for many philanthropic agencies, the Victorian Order came through the year with a very substantial credit balance. Mrs. Dennis, who has presided most devotedly over the affairs of the branch since its inception was re-elected to the presidency.

Some changes in policy of the Medical Society of Nova Scotia have recently been effected. Dr. Smith L. Walker, who has done a great deal of excellent work and has been instrumental in the organization of branches which now cover every part of the province, has retired from the associate-secretaryship. The Medical Bulletin, formerly edited by Dr. Walker, has been placed under an editorial board of which Dr. George H. Murphy is chief. Collaborating with Dr. Murphy are Drs. S. J. MacLennan, H. B. Atlee and A. Birt. Dr. Walker will act as secretary to the board, and will co-operate otherwise with officers of the society as time permits. The *Bulletin* has been somewhat enlarged, but retains its attractive form and will undoubtedly continue to hold its popularity with the profession of the Bluenose province.

Seven nurses were graduated from the training school of the Grace Maternity Hospital, Halifax, on the fourteenth of January, in the presence of a large number of friends and admirers. Several speakers made complimentary reference to the work of the hospital and its nurses. The Florence Nightingale pledge was exacted from the graduates by Dr. C. S. Morton, who fittingly impressed upon them the obligations which are imposed

in admission to the nursing profession. Mrs. Dennis, in presenting the diplomas, addressed a few well-chosen words to each recipient—a feature of the occasion which was particularly pleasing. Grace Hospital is one of a chain of institutions admirably administered by the Salvation Army, and, under the capable superintendence of Staff Captain Clarke, has won the confidence of the profession and laity alike. A brief review of the operations of similar Salvation Army hospitals throughout Eastern Canada, by Colonel DesBrisay, added much to the interest of the evening's proceedings. Besides training its own nurses, Grace Hospital also provides instruction in obstetrical nursing to the nurses of the Victoria General Children's and Nova Scotia Hospitals.

QUEBEC

Among the portraits of the Makers of McGill University's history, that grace the walls of the assembly hall in the Medical Building, has recently been placed the portrait of Dr. Francis J. Shepherd, M.D. L.L.D. F.R.C.S. for many years Dean of the Medical Faculty. The painting is the work of Miss Gertrude DesClayes, and is a gift to the University from many admirers of Dr. Shepherd, but chiefly from his former housemen and students. The unveiling took place on the 13th, and was preceded by a reception given by the Faculty at which Dr. C. F. Martin and Mrs. Martin presided, and received the guests. Brigadier General Birkett, chairman of the committee presented the painting to the university, saying that in doing so his students were paying respect to a beloved teacher whose widespread reputation in anatomy, surgery and dermatology had done much to make the name of McGill famous in many quarters of the world. Dr. F. G. Finley who also spoke on behalf of the donors said that few members of the faculty had brought to it greater distinction than Dr. Shepherd. He referred to the high standing of Dr. Shepherd both as a surgeon and a teacher, a position which had been recognised by such conservative bodies as the Royal College of Surgeons of England and by the Universities of Edinburgh and Harvard, all of whom had conferred upon him their highest honours. Elected early in his career to the indoor service in surgery of the Montreal General Hospital, Dr. Shepherd had braved the prophecies of disaster made by his seniors when he dropped the carbolic acid spray and elaborate moist dressings and substituted the dry method, practically identical with that in use to-day. His sound judgment and his anatomical knowledge soon led to his phenomenal success as a surgeon, a success which we all desire to honour to-day. Dr. C. F. Martin received the portrait on behalf of the university, saying, This portrait will remain an inspiration, a symbol of what a graduate of McGill with high ideals may become, not only as a surgeon but as a man of wide culture and the highest attainments.

In returning thanks Dr. Shepherd recounted the story of his early studies abroad, in England and on the Continent, in company with the late Drs. George Ross and William Osler. He referred to the invitation received while abroad to become associated with the Chair of Anatomy, and detailed his preparation for his new post, followed by his introduction of the newer methods of teaching anatomy into McGill from Europe. He also referred to the method of training by clinical teaching at the bedside, which McGill had early adopted from Edinburgh and which for many years made McGill preëminent as a school of clinical medicine in America.

Tea was served and a large company of friends greeted Dr. Shepherd and Miss Shepherd with all good wishes for the future.

Poor patients suffering from incurable diseases other than tuberculosis will receive treatment in the new Hospital for Incurables recently erected, and 200 tubercular patients will also be cared for in the new Sacred Heart Hospital at Cartierville near Montreal, according to contracts which have just been authorized on the recommendations of Dr. S. Boucher, Director of Public Health.

The need for awakening community consciousness to the necessity of dealing with the preventive side of mental disease, and the urgent need for the provision of facilities for treatment in the way of a psychopathic pavilion or wards in general hospitals were the outstanding points emphasized by Dr. W. T. B. Mitchell, Medical Director at the annual meeting of the Mental Hygiene Committee of Montreal. The functions the committee were carrying on at the present time were: the examination and treatment of persons referred to the committee or appealing directly to it for help: and the interpretation of the significance of behaviour disorders in a community. For the first, they were fairly well organized. In the second, a small beginning had been made, and it was this side to which attention must be more fully devoted in the coming years. In the year 1925 the clinic dealt with 708 individuals representing an increase over the previous year's work of 89 new cases. They were referred from many sources, including social agencies schools and parents. Juveniles and adolescents were examined and treated in the offices of the clinic: psychiatric cases in adults were received at the Psychiatric Clinic at the Royal Victoria Hospital. Individuals dealt with ranged in age from twelve months to seventy years.

The annual meeting of the Board of Governors of the Royal Victoria Hospital was held recently, and the report of the superintendent, H. E. Webster, was received, showing that 629 more patients had been treated than in the previous year. Total admissions numbered 9,699, of whom 4,488 were male adults, 5,211 female adults and 1,620 children. The total number of days of hospital treatment were 495 more than the previous year. Of the 380 deaths, 109 took place within 48 hours of admission. The death rate for the year was 3.9 per cent, or if those dying within 48 hours of admission be deducted, 3.1 per cent. Sir Vincent Meredith, who presided, was re-elected president.

The annual meeting of the Montreal Foundling and Baby Hospital was held in the Board Room of the Hospital. Both medical and financial reports were of an encouraging character. The past year had the lowest mortality rate, the number of children adopted was greater than in any previous year, while the health of those in the institution was better, evidencing almost a complete freedom from rickets. This elimination of rickets was regarded as due to the use of the quartz lamp, and the installation of an elevator which enabled the children in greater numbers than in previous years to be taken up to the solarium. So valuable was the use of the solarium considered that the medical board strongly urged its extension to permit its use by a larger number and for a longer time. The Chairman, Dr. Blackader, in congratulating the Ladies Board of the management on several reports, stated that he did not think any institution on this continent could show better. Continuing, he gave an interesting sketch of the hospital's history and the uphill fight with many difficulties which had finally resulted in producing conditions which permitted such an excellent report of the year's work to be made. He paid a great tribute to the self-denying labours of a small group of ladies whose efforts had

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made such an excellent report possible. He read in comparison with the past year's results, a report which appeared in the daily press in the year 1877 giving the sad tale of infant mortality of over ninety per cent in the institutions in Montreal and other cities, a mortality which appeared then to be inevitable.

ONTARIO

ADVANCE NEWS OF THE O. M. A. MEETING

Specialists in eye, ear, nose and throat work in the province will be gratified to know that Dr. G. E. De-Schweinitz and Dr. Skillern, both of Philadelphia will be present as guests of the Association and will participate in the programme, and contribute to the symposium on Headache. The first named will deal with the ocular causes and the latter with the problems of sinus infection. With them will be associated Dr. Foster Kennedy of New York who will discuss the subject in its neurological aspect.

The Radiologists will be represented on the programme by Dr. L. R. N. Hess of Hamilton whose subject will be "The right upper quadrant from the x-ray standpoint of diagnosis." Lt.-Col. Wm. Webster of Winnipeg will contribute a paper on the "Choice of anæsthetics." The other departments have their programme well under way.

Medical subjects of the forthcoming programme of the London meeting will have unusual interest to the general practitioner. Dr. Thomas McCrae whose home was near London and is now of University of Pennsylvania, Philadelphia will discuss Non-Tuberculous Pulmonary Affections. Dr. Leonard Rowntree a graduate of the London Medical School and now in charge of Medicine at the Mayo Clinic will tell of the work that is being done on problems connected with the liver and its functions. The Interprovincial visitors are Dr. Chas. Hunter, Winnipeg whose subject will be Fibrositis, and Dr. Gordon Campbell of Montreal, who has been asked to repeat the lecture he gave in London on the diagnosis of the commoner skin conditions. Dr. Rudolf will speak on the newer remedies—and Dr. McPhedran on cardiac disease. Both we are sure will be greeted with enthusiasm. In Pædiatrics, Dr. Robt. R. Macgregor of Kingston will give a paper on Chronic Intestinal Indigestion and Dr. Edward A. Morgan of Toronto will discuss the Pneumonias of Childhood. Dr. George Stevenson of the Ontario Hospital, London, will describe The early Manifestations of Insanity, and Dr. Foster Kennedy of New York will talk on the Neurological Phase of Headache.

The meeting will be staged in the Masonic Temple where the facilities are excellent and will prove suitable to the varied needs of the convention. Arrangements for entertainment are progressing. London has an interest in the visit of Ontario physicians and its hospitality may be counted on to augment the welcome that the Academy of Medicine of Western Ontario extends to the profession of the Province.

The schedule of out-patient clinics conducted by the Department of Public Health of Toronto has been prepared and sent to physicians in the city. As stated these clinics are conducted for the department by the various hospitals and are for the diagnosis and treatment of those patients who are unable to pay for the services of a private physician. The hospital decides whether the patient is eligible for admission to these clinics. The circular includes practically every clinic in the larger hospitals of Toronto, including the General Hospital, St. Michael's, Western, the Women's College Hospital, the Hospital for Sick Children, the Gage Institute, St. John's Hospital and the Salvation Army Women's Hospital.

The Lincoln county medical society met in St. Catharines on February the 3rd in the pleasant quarters of the old Welland Inn. After the regular business programme had been transacted Dr. N. B. Gwyn of Toronto gave an address on "The diagnosis and treatment of pneumonia and empyema."

The Harvey Club of London met on Tuesday evening February the 9th as guests of Dr. McGhie and staff at the Westminster Hospital. Various papers were presented by members of the staff. On January the 15th the Club was addressed by Dr. U. E. Bateson on the subject of "Rickets."

The annual dinner of the Hamilton medical society took place on February the 6th at the Connaught Hotel. There was a large attendance of physicians from Hamilton and the district. Dr. T. C. Routley spoke on the many benefits to be obtained by proper organization. There were interesting lantern slides presenting representations of men in the Hamilton profession, under various conditions of life less purely medical. This most interesting part of the programme was carried out by Dr. Gerald Glasco. Mr. Charles Bell K. C. well known in the legal profession of the province and a man of many medical interests spoke on the relationship of the legal and medical professions. Dr. Gwyn of Toronto gave an illustrated talk dealing with the "Early life of Sir William Osler as spent in and about Hamilton," making at the same time a plea that the medical profession listen kindly to the idea of the proposed Osler memorial which is to be established in the neighbourhood of Hamilton and Dundas.

Dr. Primrose of Toronto gave one of the first of the post-graduate lectures which are being put before the profession of the Dominion by the Canadian Medical Association, in Hamilton on the afternoon of February the 6th. Dr. Primrose took as the subject of his address "Questions in the diagnosis and treatment of tumour of the breast."

A dinner was given by the Academy of Medicine of Toronto to Dr. Donald Balfour of the Mayo Clinic on the night of February the 2nd. Dr. Balfour addressed the Academy on the same evening on "Peptic ulcer."

The annual reception to the students graduating in medicine which has become part of the Acadamy of Medicine's annual programme, took place on Friday February the 5th. Students' night has now become an essential part of the Academy life since its initiation three years ago. In addition to the reception programme there were addresses on the subject of medical jurisprudence by Dr. J. H. McConnell, and on the interesting features of the old numbers of the *Lancet* by Dr. W. B. Howell of Montreal.

Dr. T. K. Holmes, Dean of the medical and surgical profession of Ontario, celebrated his 87th birthday on January the 18th. One is interested in noting that this splendid representative of the medical profession is still active and taking an interest in all current affairs and in medical activities.

On January 13th, Dr. L. J. Austin of Queen's University, Kingston, addressed a meeting of the North Bay Medical Society, on "Injuries to the elbow in children"; "When to operate in head injuries," and on "Fistula in ano." Proceeding to Sudbury, Dr. Austin

addressed the Sudbury Medical Society on the evening of January 14th.

At regular meetings of the Hamilton Medical Society, held recently, the following addresses were given:—January 20th, "Tumours of the breast," Dr. A. Primrose; January 27th, "Diagnosis and treatment of infectious diseases of the nervous system." February 17th, "The physiology of insulin."

On January 29th, Dr. A. P. Hart addressed the Sault Ste. Marie Medical Society on "Cardio-vascular diseases of children."

The North Waterloo Medical Society met in Kitchener on January 21st, Dr. Beverley Hannah of Toronto gave an address on "Antitoxin in the treatment of scarlet fever" and on the "Dick test and immunization in scarlet fever."

The Muskoka District Medical Society met at the Muskoka Hospital for Consumptives on January 27th, Dr. R. I. Harris gave an address on "Tuberculosis of the bones and joints." N. B. GWYN

The February meeting of the York County Medical Society was held on Thursday, February 4th at the Toronto General Hospital. The members of the Society were the guests of Professor Clarence L. Starr and his associates. Dr. Starr and his staff gave ward clinics and theatre demonstrations showing the most modern methods in the treatments of fractures, and the use of plaster casts and splints. This meeting was one of the best and most profitable meetings in the history of the Society. S. W. OTTON

On January 12th, the McGill Graduate Society of Ottawa held its annual meeting at the Chateau Laurier with the President Dr. J. F. Baskin in the chair. Mr. O. S. Finnie, B. Sc. was elected President for the ensuing year. The guest of the evening Prof. C. F. Martin, presented to the graduates present an historical sketch of their University, aided by numerous lantern slides. He illustrated the growth of the University from its earliest days to the present time.

Prof. C. C. Chipman was recently entertained by the society at a luncheon in the Chateau Laurier. At the close he delivered a most eloquent and instructive address under the title of "Old Lamps for New" in which he compared the old ideals of life with those of the present age. He referred to the new ideals, new thoughts and new outlook that has replaced the old and the change that was inevitable.

On January 22nd. Prof. E. W. Archibald delivered an instructive address upon the results of his experience in the operative treatment of pulmonary abscess.

A clinical night was held at the General Hospital, Dr. Valin, the president, presiding. Numerous hospital patients were presented. The paper of the evening was read by Dr. W. J. Stevens on "Rectal etherization in obstetrics."

The Society was also addressed during the month by Dr. MacDonald of St. Catharines who presented his views upon the causation of high blood pressure by hepatic secretion, and the remarkable reduction of pressure after the hypodermic employment of specially prepared extracts of the liver. The subject was treated in a most reasonable and scientific manner and received with much appreciation. H, B. SMALL

MANITOBA

Dr. C. E. Fortin recently underwent a serious operation.

Dr. C. E. Argue, who has been on the interne staff of the Winnipeg General Hospital for the past three years has located at Hanna, Alta.

Miss Elsie Wilson has been engaged by the Provincial Department of Health to act as a field worker in tuberculosis work throughout the province.

Dr. Margaret Rioch who last year carried on clinical and biochemical research work in connection with pernicious anæmia is now engaged in research work in Toronto.

The College of Physicians and Surgeons having through the trustees of the Gordon Bell Memorial Fund placed the necessary funds at its disposal the Medical Research Committee will proceed to the appointment of a Fellow, to be known as the Gordon Bell Memorial Fellow of the College of Physicians and Surgeons of Manitoba, on or before June 1, 1926. The Fellow will devote his (or her) whole time to research work on problems, clinical and chemical, related to pernicious anæmia and the leukaemias under the direction of the Committee and in the Medical Research laboratory. The Fellow must have graduated, or be about to graduate, in medicine at the University of Manitoba, or be a registered practitioner in Manitoba.

Dr. Duncan Graham of Toronto and Dr. Frank Patch of Montreal, were the speakers at a crowded meeting of the Winnipeg Medical Society on the evening of Feb. 15th. Dr. Graham's address was on "Jaundice" and Dr. Patch spoke on "Infections of the Upper Urinary Tract." This was the first meeting in Manitoba under the extra-mural post-graduate scheme of the Canadian Medical Association. These two were guests of honour at a special clinical luncheon at St. Boniface at noon that same day. Accompanied by members of the Manitoba Medical Association they left on Feb. 16th to address meetings at Portage la Prairie, Brandon, Neepawa and Dauphin.

SASKATCHEWAN

Dr. B. R. Burwash of Hawarden has left the province and is now located at Baltimore, Ontario.

Dr. A. W. H. Edgelow has left Kenaston and is now practicing in Vancouver.

Dr. Geo. Kinneard has moved from Quill Lake to Semans, Sask.

Dr. H. E. Alexander has returned to Saskatoon after spending an extended period in Great Britain and obtaining his F.R.C.S. at Edinburgh University.

Dr. M. L. MacIvor is now practicing at Canwood, Sask.

Dr. J. MacDiarmid, a graduate of Manitoba University, (1925) and holding L. M. C. C., is now practicing at Lucky Lake, Sask.

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ALBERTA

With regard to the proposals made by George Hoadley, minsister of health, when addressing the Calgary Medical association, in respect to the establishment of an appeal board to function in appeals against disciplinary actions ordered by professional bodies, Dr. Galbraith, when asked his views as to these, submitted a very pointed statement. As president of the Lethbridge Medical Council, Dr. Galbraith traversed the statements made by Mr. Hoadley in regard to the forming of a new board and the matter of fee-splitting and other opinions expressed by the minister, the doctor said:

"George Hoadley sent down to the Lethbridge convention of the U.F.A. one of the ministers to tell them that he had decided to curtail excessive operations and some other things of the same character. A most commendable thing, but the only trouble is that George Hoadley had no more to do with it than he had with designing the solar system.

"This time Mr. Hoadley has been displaying his ignorance of some other medical and professional matters by proposing a new board, with considerable expense, to review the disciplining powers of doctors and lawyers, while all the time full provision exists in the law for appeal from their verdicts to the supreme court, a body that we all know and have confidence in. More laws, more officers for the people to pay for. And the people did not know, nor does George Hoadley know, that only one case has been taken to appeal from the doctors' court in twelve years.

"Travelling coroners is his latest proposal. To hear him talk one might suppose that coroners were not now investigating sudden deaths from operations, or following operations, whereas this has been the custom and law as long as we have had coroners.

BRITISH COLUMBIA

The regular monthly meeting of the Victoria Medical Society was held February 8, 1926. Dr. Hermann M. Robertson addressed the Society on Recent Advances in Surgery, and told of some of the things he had seen in Montreal, at Philadelphia and at Rochester.

Dr. D. M. Baillie told of the newer things in Medicine. Dr. Russel B. Robertson had prepared a review of the recent literature in Obstetrics and Gynæcology. Dr. Stuart G. Kenning had combed the recent work in Pædiatrics and Dr. Rundle Nelson had reviewed Radiology.

Dr. A. U. Jeffery, for some months an interne at the Vancouver General Hospital, is now practicing at Sumas, Wash.

Dr. Douglas Corsan of Fernie, B. C. was a recent visitor to Vancouver.

In January the Executive Secretary paid his annual visit to practically every doctor on Vancouver Island, including Victoria, with gratifying results. Ninety-five per cent of the profession paid their membership fee for the current year, whilst two new members joined the Association. Numerous troubles of an economic nature were submitted for advice or help from the Association, particularly in regard to Workmen's Compensation matters and a lively interest was manifested in the various activities of the Association.

It is gratifying to notice the increasing readiness with which members pay their dues early in the year, showing the importance they attach to membership in the B. C. Medical Association. In the first month of the year some 100 members sent in their subscriptions, an increase of 120 per cent over the number paid up this time last year.

Considerable work on the part of the Publicity and Educational Committee of the B. C. Medical Association, and the co-operation of a number of members who had been asked to assist, enabled us to commence on Feb. 1st publishing Health Articles in ten B. C. newspapers. Already we have sufficient articles on hand to publish daily for three months. It is hoped also that weekly radio health talks will start on the first of March.

Recently, in Vancouver, a large committee of prominent men has been formed to devise schemes for ameliorating the lot of certain ex-service men who are handicapped in their search for employment by physical disabilities of various kinds, due to their service. Such committees in other parts of Canada have been very successful, and have accomplished a great good. Several well known business and professional men have allied themselves with the project, amongst them Dr. R. E. McKechnie. The B. C. Medical Association was asked to appoint a representative and Dr. A. M. Warner of this city, has consented to act. As an overseas man himself, with an enviable record, and as one who has kept in close touch with returned men through his appointment as Vocational Medical Officer at Shaughnessy Hospital, Dr. Warner is peculiarly fitted for this work, and will, we are sure, have the hearty endorsement of all medical men.

Arrangements for the forthcoming annual meeting of the Canadian Medical Association are well under way in Victoria. All members of the profession are asked to plan their arrangements for the summer with this meeting in mind.

Copies of a booklet issued by the London Life Assurance Co., of Ontario, on the work of Child Welfare Clinics, are being obtained for circulation through the province to medical men. These are full of valuable and interesting information, and will be found useful.

We are very pleased to know that Dr. Oliver Large of Vancouver has quite recovered from the effects of the accident sustained before Christmas, and has resumed practice.

At a meeting of the Board of Directors of the Vancouver General Hospital recently held, the following gentlemen were appointed to the Consulting Staff of the Hospital: Dr. J. M. Pearson, Dr. H. M. Cunningham, Dr. B. D. Gillies and Dr. Conklin.

The February issue of the Vancouver Medical Association Bulletin contains a short article by Dr. H. Winslow Hill on a new dialyzing membrane, which may prove of interest to laboratory workers.

Just to make our Eastern friends envious—roses were blooming in our Vancouver gardens—in the open—on Christmas Day. How's that for weather?

On Tuesday, February 2nd, the Vancouver Medical Association had the pleasure of a visit from Dr.

J. Tate Mason, and Dr. L. J. Palmer, of the Virginia Mason Hospital of Seattle. Dr. Tate Mason gave an interesting talk on Surgery of Thyroid Diseases before the Association at its monthly meeting, and Dr. L. J. Palmer discussed the question of Surgery in the presence of Diabetes Mellitus. Both addresses were illustrated by slides.

Through the courtesy of the Committee of the Canadian Medical Association Post-Graduate Scheme it is hoped to hold a special meeting some time in March, to be designated "Canadian Medical Association Night" when two speakers approved by the Dominion Association will present the programme. While the speakers have not yet been actually decided on it is hoped two prominent men from the Prairie Provinces will be the lecturers at the meeting.

J. EWART CAMPBELL

UNITED STATES

Ground was broken for the first unit of the great Medical Centre in New York on January 31, 1926. When completed this centre will house the Presbyterian Hospital, the Sloane Hospital for Women and the College of Physicians and Surgeons. It will cost upwards of $10,000,000. Adjoining the Presbyterian-Sloane combined hospital is the Harkness Private Patient Pavilion a $1,500,000 structure donated by Mrs. Stephen V. Harkness and her son Edward S. Harkness. Work on the Pavilion has proceeded rapidly and its outer shell is practically finished.

Wide interest is being displayed in the New York State Psychiatric Institute and Hospital which will be one of the institutions of the Centre. It will be used by the state for research and in the causes and treatment of mental disease. Plans drawn in the State Architect's office have been approved and specifications for bidding are being completed. Only cases of special scientific interest will be housed in the Psychiatric Institute, others being sent to the regular state hospitals

Sketch plans are being developed for the Neurological Institute, which will occupy another hospital of the Medical Centre. A building programme is being developed for the Babies Hospital which will also move to the Centre. It is expected that the institutions of the Medical Centre will be in operation late next year.

The first American Health Congress which will embrace all the various associations which have to do with preventive medicine and public health will meet in Atlantic Ctiy, May 17th to 22nd, and associated with them the leading authorities of the country in every phase of public health and health education will be present. Sir Arthur Newsholme who has been so highly influential in the development of public health work in England, will deliver the opening address. Professor C. E. A. Winslow, President of the American Public Health Association, Dr. Ray Lyman Wilbur, President of Stamford University, Dr. Geo. E. Vincent, President of the Rockefeller Foundation, and many other eminent speakers will complete a well arranged programme. In addition to this health congress, and meeting at the same time in Atlantic City the three national nursing organizations of the States will hold their biennial convention. At the same time the conference of State and Provincial Health authorities of North America will also hold their annual meeting. Efforts will be made to have the field of public health completely covered in the general and special sessions. Special railroad rates from all parts of the country have been secured and the assurance is that there will be at least 7,000 in attendance.

We are pleased to note that the Faculty of the Berlin University have reversed the action taken a few months ago refusing to give any official welcome to the Interstate Post-Graduate assemblies of American Physicians. Early in the year assurances were received from both the German Government and the Faculty of Berlin that this was no longer their attitude and that all the members of this American group of physicians will receive a hearty welcome. The following telegram was received from Professor Bier, Chairmen of the Berlin Clinic Committee of this association:—William Peck, Freeport, Ill.

Under the stated circumstances heartiest welcome,
(Signed) Bier,
Berlin, Jan. 21, 1926.

Complexity of Scarlet Fever Toxin.—In testing for the potency of scarlet fever antitoxin, Park and Spiegel noticed that an amount of horse antitoxic serum which would neutralize the toxin in a majority of children would totally fail in others. It was also noted that the antitoxic serum of different horses would occasionally vary in the ability to neutralize a toxin in the same child and finally that in some individuals in whom the ordinary amount of antitoxin was not effective there was an increased amount of antitoxin. These observations seem to prove that the scarlet fever toxic filtrate produced by a single strain was not a single toxin but a group of toxins, and that a person might be immune to one or more of the component toxins of a toxic broth and yet susceptible to others. They also prove that certain horses react in producing antitoxin more to one of the components and certain horses to another in much the same way as Park has shown—that of two horses receiving simultaneously the same quantity of tetanus and diphtheria toxins one may develop a potent diphtheria antitoxin and a weak tetanus antitoxin while the other will do the opposite.—*Jour. Immunology,* Sept., 1925.

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Book Reviews

Respiratory Function in Disease. J. C. Meakins, M. D., C.M., (McGill) F.R.C.P. (Edin.) F.R.S. (Edin.) and H. W. Davies, M.B., B.S., 478 Pages, 63 illustrations. Price 28/-. Oliver & Boyd, Edinburgh, 1925.

This monograph will prove a distinct addition to the medical practitioner's library, for it presents in a very readable manner the recent work of the modern physiological school of Haldane. It describes, as the authors state "the subject of disturbed respiratory function from the standpoint of clinical medicine." Normal respiratory function from the anatomical, the chemical and the metabolic standpoints is fully discussed in the first part of the book. The second part is devoted to respiratory function under abnormal conditions; and anoxæmia, respiratory failure, acidosis and alkalosis are explained in detail. These various disordered states or symptom-complexes are exemplified in such well-known clinical conditions as caisson disease, mountain sickness, asthma, bronchitis, pneumonia, pulmonary tuberculosis and cardiac failure. The chapter on the therapeutics of respiratory disturbances is unusually interesting. To take one disease, for example, it is urged that in pneumonia every means be employed to aid pulmonary ventilation. The patient should be given a suitable back-rest in order to facilitate diaphragmatic respiration; the inspired air should be cool and free from all irritating factors; and to overcome the interference with the proper æration of the blood, oxygen should be administered by an effectual method. The faulty methods of oxygen administration in use in the past are severely criticised; but still more to be deprecated is the postponement of its use until the patient is moribund. They regard oxygen as a drug, and therefore the amount given must be regulated by the needs of the patient. Seldom is it necessary to provide more than two litres of oxygen per minute. This amount should result in the relief of cyanosis, delirium and restlessness, and should induce a fall in the pulse rate. The ideal method of administration—the oxygen chamber—is not generally available. Every hospital, however, should be equipped with the Haldane oxygen administration apparatus; an apparatus devised for the treatment of patients gassed in the recent war. The authors frankly admit that some patients, especially those of the asphyxial type of respiratory failure and suffering consequently from severe dyspnoea, strongly object to the mask; when patience and personal persuasion are of no avail, some other method, as the nasal catheter or mouth tube may be employed. By these latter methods, three to four litres per minute should be administered, as half the oxygen is lost during expiration. The authors have little or no confidence in such drugs as caffein, strychnia and atropine as respiratory stimulants, for they do not primarily increase the depth of respiration, nor secondarily increase its rate. The last chapter of the book is devoted to the technique of blood gas analysis. In conclusion, it may be stated that the arrangement of the subject matter is rational, the style excellent, and each topic is logically presented. C. P. HOWARD

Essentials of Psychiatry. George W. Henry, M.D. 199 pages. Price $2.75. Williams & Wilkins Co., Baltimore, 1925.

In his foreword the author states that in his student days he was impressed with the inadequate presentation of personality disorders, their nature and causation, in the text-books of that time, and that he resolved then to write a book presenting the subject in clear and comprehensible form as soon as his experience should be broad enough. With praiseworthy perseverance and labour he has attained his objective in a most readable book. His ideas are expressed in plain English, avoiding many of the technical terms commonly found in books on psychiatry and the complicated phraseology by which some authors try to screen their own fogginess of thought.

Personality development is sketched in a very interesting way from the evolutionary standpoint, and on this basis the author proceeds to describe personality disorders. Unevenness of development and consequent disharmonies between the instincts of self and race-preservation and the social instinct may produce psychoses or psychoneuroses. The psychic mechanisms of repression, suppression, compensation, defense reaction, and projection, are clearly described, with illustrative cases.

The author's practical classification of personality disorders is as follows:—first, those psychoses in which the disorders are largely psychological in nature, namely the affective (or manic-depressive), paranoid, schizophrenic and psychoneurotic disorders. Second, the toxic-infectious and exhaustive psychoses. Third, the psychoses in which there is actual anatomical change in the nervous system, particularly in the brain. Fourth, the personality deviations due to constitutional defect. The chapters devoted to the description of these groups are necessarily brief but are clearly written, and illustrative cases cited.

In his principles of treatment the author advocates discretion and wise selection of treatment based on the study of each individual case. He is evidently not biased in favour of any one method. Psychoanalysis, of which a brief but practical description is given, is recognized as a method of treatment especially useful in the psychoneuroses. Suggestion, persuasion, hypnotism and re-education are briefly discussed.

The chapter on psychiatric nursing by Miss Poston is excellent. It is essentially practical, and can be read with great profit by anyone concerned with mental cases.

In his discussion of the psychopathology of the normal the author describes the evolution of personal traits which distinguish groups of so-called normal individuals and which, when accentuated or exaggerated are considered abnormal. We are all apparently a wee bit off in some respect or other. This chapter is very interesting. The book closes with a chapter on psychiatric history. A. G. MORPHY

Malignant Disease of the Testicle. Harold R. Dew, M.B., B.S., F.R.C.S., F.A.C.S., 168 pages, 52 illustrations. Price 21/-net. H. K. Lewis & Co., Ltd., 24 Gower Place, London, W. C. 1, 1925.

This small volume, which is composed of 122 pages of monograph and an appendix of forty-five pages of case histories, embodies the chief facts put forward by the author in his Jacksonian prize essay on "Malignant Disease of the Testicle" in 1923. In the opinion of the writer of this review, monographs of this sort are looked upon as the most valuable constituents of his library.

In this monograph the writer points out that owing to the relative rarity of the disease no individual surgeon or pathologist has an opportunity of studying any very large number of cases. Even in the practice of a large hospital many years must elapse before sufficient numbers can be collected to make a series large enough to be of much use for statistics or study.

After consideration of the anatomy and develop-

ment of the testicle, morbid anatomy and histology of tumours of the testicle are considered. The relatively scant literature on the subject is briefly reviewed, and a presentation of the neoplasms of the testicle made from the histogenetic aspect. The various types of tumour each receive individual consideration, and the important fact noted that there are only two tumours of the testicle which are at all common. These are teratomata with their malignant derivatives, and the spheroidal carcinomata derived from the seminal tubules. Particular attention is drawn to the fact that it is difficult to be certain of the benign character of any tumour without histological examination.

In Chapter III the relative frequency of different types as found by various writers, and the author's own series of thirty-nine cases is cited; also the relationship of trauma, abnormal position of the organ, and infection as causative factors in the development of malignant disease. In Chapter IV, clinical aspects and differential diagnosis is considered.

The last chapter is utilized for a consideration of prognosis and treatment, including treatment by means of radiation and Coley's fluid. Experience has definitely proved that simple orchidectomy has failed to cure malignant disease of the testicle. It has been proved beyond doubt that the lymph glands which drain the testicle can safely be removed by operation, and this ideal procedure is now established as the operation of choice in malignancy of the testicle.

To the investigator who, in the near future, may have to enquire into the subject the appendix, in which are given in very considerable detail the case histories of forty cases, is probably the most important part of the book. Although the reading of a number of histories in sequence may be fatiguing as a pastime, the fact that such information is available is of great value.

In so far as book-making, type, and quality of paper is concerned, the book is excellent. The illustrations are well drawn and well reproduced. The monograph, as a whole, will undoubtedly fill an important place in the library of those interested in this branch of pathology and surgery. F. B. GURD

Swanzy's Handbook of the Diseases of the Eye and Their Treatment. Louis Werner, M.B., F.R.C.S.I. Thirteenth edition. 698 pages, illustrations. Price 21/- H. K. Lewis Co., 136 Gower St., London, W. C. I., 1925.

The fact that this work has reached its thirteenth edition is sufficient proof of its merit. The text has been completely revised and some minor re arrangements made, while new illustrations have been added. The print is clear and the illustrations good. The use of a black background in the diagrams on optics and refraction is an advantage.

The chapter on cataract well illustrates the practical nature of the book, and also how widely technique and treatment vary in different centres. The steps in the operation of cataract extraction and the after-treatment are described in considerable detail. Preliminary iridectomy, a procedure so widely adopted on this side of the water, is given scant notice and the post-operative treatment also differs considerably from that followed in this country.

The book embodies the experience of a great ophthalmologist and a perusal of it will well repay the specialist, while the student and general practitioner will find the subject discussed in a clear, concise manner.
C. W. GRAHAM

An Introduction to Objective Psychopathology. G. V. Hamilton, M.D., 354 pages. Price $5.00. The C. V. Mosby Co., St. Louis, 1925.

In his preface the author describes his book as a psychopathologist's account of his studies and his interpretations of various modes of human and animal behaviour. His revealed methods, he modestly states, are provisional and in need of refinement, and his interpretations tentative.

Dr. Yerkes in his foreword gives the author high praise for his originality, consistent hard work, and sincerity and hails his book as the first chapter of nervousness, in contradistinction to psychoanalytic psychopathology is defined as a branch of medicine which employs the method of natural science in explaining nervousness, in contradistinction to psychoanaltic psychopathology which is more speculative and deals with unconscious mental activities. The author contends that modified fears and other abnormal mental responses may be assumed to be due to appropriate physical stimulations and to the responsive properties of the physical body.

Although it must be admitted that heretofore mental phenomena have been studied to an unduly large extent as such, and without due reference to physical conditions, we cannnot ignore mental trends in any individual, either inherited or acquired through environment, no matter whether we accept Freud's theory of the unconscious or not.

But still the author's studies of human reactions to baffling disadvantages in comparison with those of animals are stimulating and instructive. His record of two hundred cases of people in a small typical city in the Mississippi Valley is extremely interesting, and may be read with profit by any internist, surgeon or psychopathologist. The infra-rational non-adjustive response to baffling disabilities, either external or internal or to unsatisfied major cravings is the striking feature in a large proportion of these cases; and the comparison of such responses to those of animals placed under external baffling disadvantages is well brought out. Incidentally, it appears in quite a few cases that adequate physical examination had not been made, and that consequently grave physical disease such as tabes had not been diagnosed. Very interesting also is the description of those cases of nervousness labelled neurasthenia, hysteria or hypochondriosis in which the discovery by the author of an organic condition such as heart disease, and a frank explanation of the patient's real disability satisfied the patient by justifying to some extent her mental attitude, and led to the disappearance of her nervous symptoms. In this way the patient assumed a rational adjustive reaction to her disability.

With the heading "Principles of psycho-pathology" the author alludes to the difficulty experienced by the average physician, whose training is based on the natural sciences, in orienting himself in the field of psychopathology, especially when psycho-analytic terms such as complex, repression, censorship, etc., are used; and he states that one of the objects of this book is to show how the methods of the natural sciences may be used as effectively in dealing with nervous patients as with all other classes of patients.

The author asserts that no psychologist has ever been able to explain human behaviour in terms of psychical determinants only, but he is fair enough to allow some value to psychic processes. In his foundations of psychopathology, the author gives outlines of the morphology and physiology of the nervous system and endocrine glands and the reactive processes of the body. He then proceeds to reason ingeniously but not quite convincingly with regard to behavioristic reactions unconsciously determined, but not psychically determined, obviously as a result of his disposition to structural physiologic views. He credits Freud with having worked out a self-determining nature of an individual's thoughts, feelings, dreams, etc., but objects to his explanation as being mystical, unscientific, and misleading.

The chapter on comparative studies to baffling disadvantages is extremely interesting, being a comparison between animal and human behaviour under such conditions, and illustrating especially the affec-

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ive, infra-rational, persistent non-adjustive response to difficulties.

The chapter on sexual behaviour is well-balanced. The subject is a difficult one. The author acknowledges the influence of Freud, but does not accept all his theories. Studies of the sexual behaviour of monkeys and dogs are aptly applied to human sexual behaviour.

In summing up the book after careful study of it, one can say that it is a most valuable contribution to the study of psychopathology; that the author's detail of two hundred cases illustrates his ingenuity in applying his studies in animal behaviour to cases of nervousness in human beings, often with good therapeutic results; and that the book may be read with great profit by anyone interested in the problems of nervousness. A. G. MORPHY

Practical Pathology including Morbid Anatomy and Post-Mortem Technique. James Miller, M.D., D. Sc., F.R.C.P.E., F.R.S.C. 528 pages including illustrations. A. & C. Black Ltd., 4 Soho Square, London, W. I., 1925.

This is a small handy volume of some 530 pages, appearing in the well-known Edinburgh Medical Series. That it has come to a second edition after ten years is proof that it has been of use.

The intention of the author has been to provide the student of medicine and the practitioner with the information required for practical work in relation to Pathology, in a convenient form. This intention has been very successfully realized.

The work begins with some general considerations in regard to post-mortem examinations and the necessary equipment for them. It may, perhaps, be remarked that there are better autopsy tables than the type which the author recommends. The author gives in detail his method for conducting autopsies, and also, in brief, the methods of Letulle and Shennan. While most operators develop a technical individuality of their own, the instructions given will be most useful to the medical man who is only occasionally called upon to perform such work. The chapter dealing with the performance of autopsies on the fœtus and newborn child, and those having a medico-legal aspect, will be found most helpful.

Short descriptions of the morbid changes affecting the various organs are given systematically, together with their causes and effects, and with sufficient histological detail to guide the student in further study. There are two appendices containing brief instructions for preservation of museum material, the staining and cutting of tissues, some bacteriological technique and embalming. More than one hundred figures are given illustrating the commoner gross morbid conditions, with some, of a more unusual character, presenting certain details that are of importance in the actual manual conduct of post-mortem examinations.

The book is not for the advanced worker but can be highly commended for the student and the practitioner who is somewhat "rusty" in his Practical Pathology. A. G. NICHOLLS

Diseases of Infants and Children. Henry Dwight Chapin, A.M., M.D., and Lawrence Thomas Royster, M.D. 633 pages, 162 illustrations and charts. Price $6.00. Williams Wood & Co., New York, 1925.

Much of this book has been entirely rewritten, bringing it completely up to date. Special emphasis is laid upon newer methods of diagnosis and prophylactic treatment of diphtheria and scarlet fever. The chapter on nutrition and infant feeding might have been more detailed, although all the new advances are noted. Like most text-books, too little attention is given to detailed treatment and management, and more benefit might be obtained by illustrative case histories. The chapter on social pediatrics and the description of the Speedwell system of boarding babies is excellent.

The book is replete with many good illustrations. For the student and general practitioner this book can be safely recommended. ALAN BROWN

Aviation Medicine. Louis Hopewell Bauer, M.D. 241 pages, illustrated. Price $7.50. The Williams & Wilkins Co., Baltimore, 1926.

From the point of view of the general practitioner, this book is interesting in its bringing out the unsuspected medical factors which enter into the pursuit of flying. Most people now recognize that the haphazard methods which necessarily were followed in choosing aviators at the beginning of the war, are no longer allowed. On the other hand, few probably realize what elaborate researches are being made in this matter. Major Bauer has attempted to bring together all the work that has been done in connection with the medical aspects of aviation, and whilst we hardly anticipate with him the development of a very definite specialty in "aviation medicine," he has succeeded in showing that the medical practitioner cannot be expected to give competent guidance in the selection of flyers either for military or commercial service. How much depends on careful selection may be realized from the statement that during the first year of the war, of every 100 aviators lost by the British, two were killed by the enemy, eight because of defective machinery, and ninety as a result of some individual deficiency. At the end of the second year however fatalities due to physical defects were reduced from sixty to twenty, and at the end of the third from twenty to twelve. H. E. MACDERMOT

The Radiological Examination of the Male Urethra. G. L. S. Kohnstam, M.R.C.S., L.R.C.P., and E.H.P. Cave, M.B., B.S., M.R.C.S., etc., with a preface by Sir John Thomson-Walker, O.B.E., M.B., C.M., F.R.C.S. 115 pages, 64 illustrations. Price $4.50. The Macmillan Co. of Canada, Toronto, 1925.

This monograph contains a good review of the early work on the subject, together with carefully prepared sections on technique and interpretation. It should prove a helpful guide to the radiologist and genito-urinary surgeon who wish to undertake this field of work. The illustrations, particularly the projection diagrams, are well done and illustrate many practical uses.

Through the instructions given in the section on technique are quite definite there remains the possibility of minor errors which may lead to grave difficulties in interpretation. The methods outlined will no doubt prove to be useful adjuncts to the present cystoscopic and urethroscopic methods of examination of the bladder outlet and urethra in obscure cases but will in no way replace them.

This method of study of the deep urethra leads the authors to believe that sphincter control of the bladder is not dependent on a definite internal and extensive sphincter action but on action of the prostatic urethra as a whole. This is an interesting observation which will justify further observation.

It is not probable that this method of examination will enjoy lasting popularity because of its exacting technique and the fact that two collaborators are required to make the study, while the information obtained may generally be gained by more simple methods.

The authors are to be congratulated on the concise and easily readable form in which they have presented their interesting observations. Their work should be of value to all urologic surgeons who desire to be acquainted with the most modern methods of investigation. GORDON S. FOULDS

An Index of Treatment by Various Writers. Robert Hutchison, M.D., F.R.C.P., and James Sherren, C.B.E., F.R.C.S. Ninth edition revised and enlarged. 1035 pages, 89 illustrations. John Wright & Sons Ltd. Bristol. The Macmillan Co. of Canada, Toronto.

An index of treatment will always be faced by the difficulty of avoiding on the one hand unwieldiness, and on the other incompleteness. The original plan of this volume aimed particularly at describing only the most simple and effective methods of treatment, and great praise is due to the editors for the manner in which they have carried out their task. The various editions which have appeared have been the occasion for constant enlargement and have kept well up to date, whilst the keynote of conservatism is well sustained. The introductory comments are particularly apt and stimulating. How much do we nowadays need such cautions as this: "tend rather to adhere to the old and tried methods than to be always running after new gods. Don't be blown about by every wind of doctrine; but preserve a cool, detached and rather skeptical attitude to the latest therapeutic craze until its merits have been thoroughly and scientifically tested." But this is not to be taken in the sense of bigotry or intolerance, for "one should also be eclectic and ready to accept methods of proved efficacy, no matter whence they come. It is possible to get therapeutic hints even from laymen, bone-setters, or Christian Scientists."

The contributors include some of the most noteworthy medical men in Great Britain, and in all respects the book forms a trustworthy and clearly arranged index of modern methods of treatment.

H. E. MACDERMOT

Textbook of Forensic Medicine and Toxicology. John E. W. MacFall, M.D., D.P.H., Ninth edition, revised. 445 pages, illustrated. Price $4.50. E. & S. Livingstone, Edinburgh. The Macmillan Co. New York and Toronto, 1925.

Prof. MacFall has revised Buchanan's Text-book which in its earlier editions as Husband's *Forensic Medicine* was well known as a favourite manual for students and junior practitioners. The parts of the work dealing with leagal criminal procedure, lunacy certificates, unqualified assistants and sale of poisons make specific reference to the legal requirements in the British Isles and do not generally apply in Canada. It is a well written text for students and should meet with the same kindly reception in the schools of medicine as did the earlier editions of the work.

V. H. ELLIOTT

International Clinics. Henry W. Cattell and others. Vol. III. Thirty-fifth series. 309 pages, 68 illustrations. Price $3.00. J. B. Lippincott Co., 201 Unity Bldg., Montreal, 1925.

This volume on the whole contains much that is of value to the general practitioner. The balance between subjects of surgical and of medical interest is well kept, and the questions dealt with are those that are under frequent discussion at present.

Publications such as these are possibly of most value when a series is at hand so that various subjects can be followed through volumes, even though they may not be taken up under exactly the same heading in each volume.

It is obvious also that the collaborators are not all of equal capacity. In the volume under review we may mention one or two papers of particular values such as the one by Dr. J. B. Deaver on the causes and differential diagnosis of the acute abdomen; by Dr. J. B. Collip in reviewing his own work on the parathyroid glands, and by Dr. Jablons on Thromboangiitis Obliterans, who deals with a series of 200 cases of this condition.

C. E. BROWN

The Surgical Clinics of North America. Vol. 5, No. 5, (St. Louis Number, October, 1925). 315 pages, illustrated. Price, paper $12.00; cloth $16.00 per clinic year. W. B. Saunders Co., London and Philadelphia: McAinsh & Co., Toronto.

This volume contains the usual number of good papers on surgical subjects, and is from the Clinics of St. Louis. Among these the following are noticeable Dr. Bartlett discusses the problem of the choice of operation when two conditions present in the same patient for which operation would be indicated, one of these being thyroidectomy; this operation he says should never be done at the same sitting with another major operation. Dr. Sachs presents various types of lesion of the central nervous system amenable to surgical treatment, cases illustrating dural endothelioma, glioma, and fourth ventricle papilloma are cited, and these are removed under local anæsthesia. Dr. Fisher discusses tuberculosis of the cæcum, both primary and associated with tuberculosis of the lungs, with citation of cases. He practices resection of the cæcum and ascending colon with lateral amastomisis. Excellent results are recorded. The recent improvements in radiography of the gall bladder are discussed by Dr. Graham, who has done so much to bring about these improvements.

C. E. SMYTH

Textbook of Histology. Bailey. Revised by Oliver S. Strong, A.M., Ph. D., and Adolph Elwyn, A.M., Seventh edition. 938 pages, illustrated. Price $7.00. William Wood & Co., New York, 1925.

The modern medical student can never complain of lack of aids to learning; rather indeed, may he find it hard to select from the abundance which he has presented to him. A book however which rests on so sure a basis as Bailey's "Histology" gives a welcome sense of security, and this last edition shows the results of the usual careful and complete revision which has always characterized the previous editions. The changes which have been made have led to considerable expansion, as has been the case of other anatomical books, e.g., Cunningham's dissecting manual. Much of this is due to the new and very excellent illustrations which are introduced, but there is also a great deal of new matter; there is for example reference to the recently established fact of the contractile element in the walls of blood capillaries. Perhaps a little more might have been made of Krogh's researches on the anatomical distribution of these blood channels.

The tendency for a separation to occur between the teaching of histology and that of anatomy has been recognized, and is guarded against as well as may be done. In all respects this textbook is one which serves the teacher no less completely than it does the student.

H. E. MACDERMOT

The Vital Capacity of the Lungs. By J. A. Myers, M.D. 140 pages, 32 illustrations. Price $3.25. The Williams & Wilkins Company, Baltimore, 1925.

This book will be appreciated by those clinicians interested in diseases of the heart and lungs. It is a compilation of the literature, and especially the more recent portions of it, on the application of measurements of vital capacity to pathological conditions of heart and lungs. The work is admittedly influenced by the studies of Dreyer on the value of the vital lung capacity tests in aviation.

The author, first of all, reviews factors other than disease which may influence the results and then shows the value of the determination by citing examples of cardiac involvement, tuberculosis, pneumonia, etc., either from his own experience or from the current literature.

The book contains very full tables which enable the user of the method to calculate and evaluate quite

XUM

easily his results. There is an excellent bibliography.

The author tries not to be too enthusiastic about the value of the test, nevertheless we think he has been a little led away by an excess of zeal when he suggests the installation spirometers in various public places, very much after the manner of the installation of weighing machines. Doubtless it would be a fascinating and interesting game for the general public to see how much air it could blow through the measuring machine, but we doubt if it "would result in bringing many who suffer from heart or lung disease for definite diagnosis and treatment long before they would otherwise present themselves."

Having made this little comment on the foible of the author we should, however, in justice state that we consider the book a valuable adjunct to those engaged in institutional work, though how far the test is applicable to tuberculosis as a prognostic sign is a matter still open to doubt. It may not be the wisest procedure to ask such a patient to expand his lungs to their fullest capacity. V. J. HARDING

Diseases of the Eye. Catechism Series. By William George Sym, M.D., F.R.C.S.E. Second edition, 68 pages. Price 1 s. 6 d. net, E. & S. Livingstone, 16 & 17 Teviot Place, Edinburgh, 1925.

This little book covers the subject in rather a remarkable way. The questions are short and direct, while the answers are comparatively full and often tabulated, —a system of teaching which has much to be said for it. The purpose of the book is for students and for them chiefly one of review. It should be found among a student's books, and even after examinations are over, he can refresh his memory in a very brief space of time on many of the essential features of ophthalmology. As is to be expected in a quiz-book of this type there are no illustrations. J. A. MACMILLAN

The Engines of the Human Body. By Sir Arthur Keith, M.D., L.L.D., D.Sc., F.R.S. Second edition, revised and enlarged. London, Wiliams and Norgate, Ltd., 14 Henrietta Street, Covent Garden, W. C. 2, 1925.

Nowhere, perhaps, is Sir Arthur Keith's art of clear exposition of scientific truth better exemplified than in the above work, which has recently appeared in its second edition. In it the complicated mechanisms of the human body are explained by comparing them with easily-understool machines; thus the movements of the trunk and limbs are found to be brought about by the operation of a multitude of levers of all three orders, powered by muscular engines. The latter are really internal combustion motors, much like those of automobiles: their intake pipes, the arteries, bring combustible fuel and oxygen, and in the muscle cylinders this is exploded through the agency of a sort of spark plug, the motor end plate (operated by a wiring system, the nerves,) and the power thus liberated sets the engine in motion. It is a pull engine—not of the pushing variety as are those of man's invention—and so gains enormously in flexibility, and has the additional advantage of cooling itself through its feed system.

The work is right up-to-the-minute, and brings in the latest knowledge upon the many subjects with which it deals. Here we find the most recent information on the physiology of muscle contraction; on the marvellous "postal system"—the endocrines—where insulin, and Dr. Banting, are given due prominence; on that wonderful catena of work-shops and laboratories, the gastro-intestinal tract, in which one factory the large intestine, is threatened with decay. We read of the perfect lubricating system found in the joints; of that ever-beating force-pump about which Harvey taught us so much, and of the mechanism for the maintenance of the constant "head of pressure" in the arteries; of the magical activities of the "pair of living bellows"; of the "automatic telephone exchanges" of the nervous system, and of the "master contrivance of the human machine"—the brain.

There is here a wealth of material for popular medical lectures, and there are hosts of suggestions to aid the physician in putting complicated scientific ideas into clear and understandable language. Indeed the book is a very good "refresher" course in anatomy and physiology and the style is so very entertaining and easy that one is carried through it right to the end.
C. C. MACKLIN

Clinical Features of Heart Disease. By Leroy Crummer, M.D., with an introduction by Emanuel Libman, M.D. 353 pages. Price $3.00. Paul B. Hoeber, Inc., New York, 1925.

This book has one valuable point which commends it, namely, originality. It is the result of clinical experience. In the preface the writer emphasizes the difference between functional and anatomical diagnosis. He points out that it often happens that a patient has marked valvular disease and at the same time an efficient heart. In the second place he emphasizes that the information in reference to functional efficiency of the heart gained by inquiry is as important, or more so, than that gained by physical or laboratory examination.

E. Libman in writing the introduction, which is full of praise, re-emphasizes the importance of accurate clinical observation, in which he himself excels.

The first five chapters deal with methods of examination, and it is to be hoped that practitioners who read the book will not neglect these chapters, as they are not at all tiresome and are very good.

There are of course a few points open to criticism. He uses the word arthritis where rheumatism would be preferable. Most physicians restrict rheumatism to rheumatic fever. Also one doubts if a pneumococcus can give a chronic valvular disease. A pneumococcus endocarditis is always acute and fatal. It is one of the rarer causes of acute bacterial endocarditis. On page 24, where the writer speaks of subacute rheumatic endocarditis, does he not mean subacute bacterial endocarditis? Jaundice points to chronic passive congestion of the liver due to failure of the right ventricle in either the absence or presence of mitral stenosis or adhesive pericarditis. Enlargement to the right of the sternum is enlargement of the right auricle, not right ventricle.

While the above are a few points with which one might disagree, there are scores of others, possibly more important, that are helpful and show that the writer is exceptionally expert and careful in inquiry and physical examination. It is interesting to note that Dr. Crummer thinks Broadbent's sign a very doubtful evidence of adhesive pericarditis. The discussion of palpation and auscultation is much better than that of percussion. He summarizes very well the value of x-ray and electrocardiograph examination, possibly undervaluing the latter.

In the discussion of irregularities it is difficult to see why Dr. Crummer doesn't believe in keeping the ventricular rate slowed by digitalis in auricular fibrillation, unless the patient is decompensating. One of the chief causes of recurrence in passive congestion in such cases is that patients give up using digitalis when better and not under supervision.

The bare statement that quinidine cures about 50 per cent of auricular fibrillation and re-establishes a normal rhythm is somewhat misleading; the great majority of the 50 per cent cures will relapse into fibrillation in a few days or a few weeks. Auricular fibrillation is not at all infrequent with aortic insufficiency. It is also difficult to understand why one should demand that the first sound should be absent before a diagnosis of mitral insufficiency be made.

The chapter on cardiovascular renal disease is

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very good. The chief point is that the important prognostic guide is the efficiency of the heart muscle. The discussion of diet for high blood pressure is ample though it occupies only a sentence and a half. He states that "dietetic regulations are fads and penances rather than forms of treatment."

A book that is based on clinical experience necessarily has strong as well as weak points as no one can have wide experience in all forms of disease. This book might possibly be improved by a chapter on bacterial endocarditis and coronary thrombosis.

JOHN A. OILLE

Eye, Ear, Nose and Throat Manual for Nurses. Roy H. Parkinson, M.D. 207 pages, 51 illustrations. Price $2.25. The C. V. Mosby Co., St. Louis, 1925.

This little book has been written for undergraduate nurses who are studying to gain a working knowledge of the eye, ear, nose and throat. It is a most practical book for the purpose. Enough is given of the anatomy and physiology of the subject to give the nurses an intelligent idea of the same. A good deal of the book is written in short paragraphs with a definite heading to each so that the student can look up a definite point that has been taken up in the lectures. It is also a most useful book for the doctor who is lecturing to nurses on this subject as it gives him a basis to work on in preparing his lectures so as not to make his remarks too long or too short on any particular part of the subject.

It is a very useful book for a nurses' library as the illustrations are good and all the descriptions and remarks are quite within the grasp of an ordinary nurse in training.

The "quiz" feature of the book is also useful as it enables the nurses to review the previous lecture before the next lecture takes place. The operating room technique is also well arranged and illustrated so that any nurse can look up the instruments for an operation in this field without difficulty. Altogether the book is a success and fulfils a long felt want as it takes the subject up in a simple but complete manner. The book should be in every hospital where eye, ear, nose and throat work is being done.

W. HACKNEY

Recent Advances in Physiology. C. Lovatt Evans, M. D. 364 pages. Price $3.50. P. Blakiston's Son & Co., Philadelphia, 1926.

Too fulsome praise as well as faint praise damns. Yet one is tempted in reviewing C. Lovatt Evans' "Recent Advances in Physiology," to use all the glowing adjectives at one's command. I do not remember any book which has evoked the enthusiastic commendation of my colleagues in physiology as has this small book.

Lovatt Evans proves to be a master in the difficult art of presenting a clear exposition in small space. He has arranged the experimental evidence which has been gathered from the data of physiological research in so logical a manner that one readily grasps the significance of the experiments, and sees how the results obtained by different workers are to be correlated.

Although in his preface the author says "this book may be called an Elementary Text-Book of Advanced Physiology" and insists that he is not writing for his physiological friends, but only students, it is certain that his physiolgical frends will be grateful to him for making this digest of recent literature. It is a great saving of time to be able to find in one place the essence of the work done in a given field, and then if necessary, go to the original papers for detail.

The subjects dealt with are—blood, work of the heart, capillary circulation, oxidations, muscle contraction, endocrine organs, including a brief review of the insulin problem, and certain reflexes. There are naturally many other physiological problems which might have been included, and each physiologist whose field is not touched, probably feels that this omission is serious. One would like to have seen a chapter on the nerve impulse, to balance the section on muscle contraction. But one must recognise the limitations of book space, and be content with the excellence of the presentation of the subjects the author has chosen to write upon.

This book can be recommended strongly to all students of medicine, who wish to learn something beyond the contents of the standard text-book of physiology, for it is an unusually clear digest and exposition of the recent advances in physiology.

January 15, 1926. J. M. D. OLMSTEAD

Reproduction in the Rabbit. John Hammond, M.A., and F.H.A. Marshall, F.R.S., 210 pages. Price 15/- net. Oliver and Boyd, Tweeddale Court, Edinburgh, 1925.

This book is one of the series of Biological Monographs and Manuals edited by F. A. E. Crew, Edinburgh, and D. Ward Cutler, Rothamsted. Like most of the publications in this series, it is primarily suited to the needs of the research worker in general biology. The treatise deals specifically with the problem of reproduction in the rabbit, though numerous valuable references are made to the work which has been done on reproductive phenomena in other animals.

The author postulates the existence of a "generative ferment" in the blood which regulates the reproductive functions. This substance is necessary for the nutrition of the generative organs and for the formation of the internal secretions of the gonads. The age of puberty, the corpus luteum, ovulation, and lactation in rabbits are discussed with particular reference to the influence of this ferment. Possibly Mr. Hammond has stressed this idea a little too much, but not enough to detract from the reader's interest in his experiments and observations.

The chapter on sterility is rather disappointing. This subject certainly deserves more space and consideration than was allotted in this case. As a contrast, the long chapter on the effects of lactation is excellent. Many of the illustrations are very good, but a few are too small for important details.

The author frequently suggests definite research problems of an interesting type, a point which is worthy of special comment.

R. J. BEAN

International Clinics. Vol. IV. 35th series. Edited by Henry W. Cattell, A.M., M.D. 310 pages, illustrated. Price $3.00. J. B. Lippincott Co., 201 Unity Bldg., Montreal, 1925.

Contains contributions from twenty six different authors. It is divided into seven sections as follows:—Diagnosis and Treatment, Medicine, Pædiatrics, Surgery, Public Health, Medical History and Special Articles. It also contains a cumulative index for the four volumes published during 1925. In addition, there are two coloured plates and thirty six plates and figures.

The section on Diagnosis and Treatment contains a timely article by Wm. D. Fleming of Washington, D. C., on "The Possibilities and Limitations of Blood Chemistry in Diagnosis."

In the section on Medicine is an article by Dr. Lewellys F. Barker dealing with the medical and surgical treatment of Raynaud's Disease. Considerable space is given up to a discussion on the benefits of periarterial sympathectomy.

The two articles under Pædiatrics should prove of general interest, as they deal with the newer treatment of Rickets and Intracranial Hæmorrhage of the New Born respectively.

The Surgical section covers questions dealing with

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general surgery, gynæcology and oto-laryngology. An extremely interesting article is contributed by Professor H. Vincent of the French Army on Prophylaxis and Treatment of Gaseous Gangrene by Specific Serotherapy. The cuts and plates accompanying the paper on Peritonitis are worthy of note.

The article on Charcot by Fielding Garrison will undoubtedly be of considerable interest to all students interested in the historical side of Medicine.

All those interested in the question of male sterility should read Abraham L. Wolbarst's contribution, and the conclusions drawn therefrom.

The concluding article in this volume deals with the Tenth Decennial Revision of the United States Pharmacopœia and includes a list of the new additions, changes, etc.

The volume as a whole undoubtedly maintains the high standard which has been set in former editions.

L. C. MONTGOMERY

Directions for the Dissection of the Cat. Robert Payne Bigelow. 47 pages. Price $1.00. The Macmillan Co., New York and Toronto, 1925.

As a preliminary to human physiology and anatomy one of two animals—the cat or rabbit—is dissected in the premedical course. Professor Bigelow classes the cat as the more suitable. He has carefully detailed an excellent method for the student to follow and recommends the "Anatomy of the Cat" by Reighard and Jennings for its descriptive detail.

The author maintains that "success in observation will depend in large measure on care in following exactly the directions for procedure, which form the important part of this book," and estimates the required time at about sixty laboratory hours. Since most schools devote less than sixty hours to such work it may be necessary for those in charge to so revise the procedure as to suit the time available.

The book includes instructions for preparation of the material. The B. N. A. terminology is used.

MYRON NOTKIN

The Surgical Clinics of North America. Vol. V, Chicago number. 246 pages, 54 illustrations. Price $12.00, cloth $16.00. W. B. Saunders Co., Philadelphia and London, 1925.

The clinics in this number are almost entirely from the department of general surgery, there being only two exceptions, one on urethral stricture and the other on stenosis of the vagina. The clinic on surgery of the spleen by Dr. Arthur Dean Bevan is particularly instructive. This subject is considered in a very comprehensive and convincing manner, as can only be done by one who is master of his subject.

Other outstanding clinics are as follows: tuberculosis of the mouth by Dr. F. B. Moorehead and Dr. K. W. Dewey. This condition is discussed very intelligently, with multiple references.

Sarcoma and carcinoma of the duodenum and stomach are reviewed, being illustrated by excellent clinical material. Spastic paraplegia occupies a goodly number of pages and the Royle operation is discussed and results tabulated. There has been improvement in the majority of cases operated upon.

The clinic of Dr. Gatewood on "An Analysis of the Results Obtained in Gastric Surgery" is particularly instructive, showing however, that results in this realm of surgery may still be improved upon. The subject is extensive and in ten pages a great deal may be learned, as the clinic is delivered in a logical manner, leading to definite conclusions.

The whole volume contains excellent clinics, absolutely no padding being noted.

A. B. MALCOLM

Voltaire and Medicine.—In the second part of his paper on Voltaire and medicine read before the Section of the History of Medicine of the Royal Society of Medicine on December 16th, the President, Dr. J. D. Rolleston, gave an account of Voltaire's allusions to anatomy and physiology, his advocacy of inoculation against small-pox, his interest in the history and ravages of syphilis, his attention to other matters connected with public health, his acquaintance with medical jurisprudence, and particularly his sceptical attitude towards historical cases of poisoning, and his reference to various diseases of social importance, such as mental disorders, convulsive hysteria at the tombs of saints and ecclesiastics, alcoholism, and the king's evil. Voltaire's interest in public health was shown, not only by his desire to control certain contagious diseases, such as small-pox, by inoculation, and syphilis by the formation of a league of nations for combating the disease—a proposal not realized until 150 years later—but also by his allusions to other epidemic diseases, especially plague, typhus, and malaria, his condemnation of the insanitary condition of the Paris hospitals, the abuses connected with the administration of military hospitals, the crowded state of the Paris cemeteries, and the practice of burial in churches, as well as by his proposal to found maternity hospitals for unmarried women. In concluding his paper, in which, as in a previous study of Lucian, Voltaire's counterpart in classical antiquity, he had collected all the passages of medical interest, Dr. Rolleston maintained that Voltaire, the founder of modern history and the most representative figure of the eighteenth century, deserved the attention of the medical reader, in that he was a powerful advocate of the profession, an uncompromising foe of quackery, and, by reason of his keen intellect and wide humanitarianism, was well in advance of his time in matters connected with public health, medical jurisprudence, and social medicine.—*Brit. Med. Jour.*, Dec. 16, 1925.